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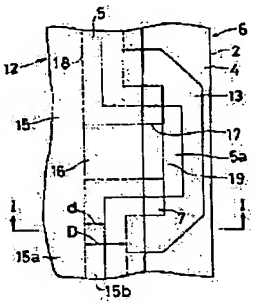
(54) LIQUID CRYSTAL DISPLAY DEVICE

(57)Abstract:

PURPOSE: To provide a small-sized liquid crystal display device having an excellent display grade.

CONSTITUTION: Transparent electrodes and a surfactant layer are formed on a translucent substrate 2 and thereafter, an oriented film 5 is formed thereon to constitute one substrate member 6. The oriented film 5 is formed in a region 15a which is a liquid crystal injection region 15, an injection hole region 16 and a region 15b which is a part of the region where an adhesive member 7 is formed. On the other hand, the spaces formed by the adhesive member 7 applied on the oriented film 5 of the substrate member 6, the oriented film 5 and the oriented film of the other substrate member are made into the space 18 to constitute a liquid crystal layer by injection of the liquid crystals and the injection hole 17 for injecting the liquid crystals into the space 18 in communication with the space 18. The width D of the adhesive member 7 and the width (d) of the region 15b superposed on the adhesive member 7 and the oriented film 5 are selected in a range of $D>d\geq 0$. A pair of the substrate members are stuck to each other and the liquid crystals are injected therebetween from the injection hole 17 and thereafter, the inlet of the injection hole 17 is sealed by a sealing member 13.



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CLAIMS

[Claim(s)]

[Claim 1] It intervenes between the liquid crystal layer which intervenes between the substrate member of the pair in which either has translucency at least, and the substrate member of a pair, and the substrate member of a pair. By the liquid crystal layer side front face of the substrate member of a pair It is constituted including the jointing material which forms the injected hole which is open for free passage to the space where liquid crystal should be poured in, and the space concerned, and the closure member which closes an injected hole. The substrate member of said pair In the liquid crystal display which has at least an insulating substrate, the display electrode formed in the liquid crystal layer side front face of the insulating substrate concerned, and the orientation film formed so that a liquid crystal layer may be contacted on the insulating substrate with which the display electrode concerned was formed, respectively Said orientation film is a liquid crystal display characterized by being prepared in the 2nd field in which an injected hole is formed of the 1st field in which the space on the insulating substrate with which the display electrode was formed where liquid crystal should be poured in by jointing material is formed at least, and jointing material.

[Claim 2] It intervenes between the liquid crystal layer which intervenes between the substrate member of the pair in which either has translucency at least, and the substrate member of a pair, and the substrate member of a pair. By the liquid crystal layer side front face of the substrate member of a pair It is constituted including the jointing material which forms the injected hole which is open for free passage to the space where liquid crystal should be poured in, and the space concerned, and the closure member which closes an injected hole. The substrate member of said pair In the liquid crystal display which has at least an insulating substrate, the display electrode formed in the liquid crystal layer side front face of the insulating substrate concerned, and the orientation film formed so that a liquid crystal layer may be contacted on the insulating substrate with which the display electrode concerned was formed, respectively The 1st field in which the space on the insulating substrate with which, as for said orientation film, the display electrode was formed where liquid crystal should be poured in by jointing material is formed at least, The liquid crystal display characterized by being prepared in the 2nd field in which an injected hole is formed of jointing material, and the 3rd field which is a part of field where jointing material is arranged.

[Claim 3] The width of face d of the 3rd field where the width of face D, jointing material, and orientation film of the field where said jointing material is arranged overlap is a liquid crystal display according to claim 2 characterized by being chosen as the range of $D>d>0$.

[Claim 4] It is the liquid crystal display according to claim 1 or 2 which the configuration of said 1st field is chosen as a rectangle, and the configuration of the 2nd field is chosen as a rectangle smaller than the 1st field, and is characterized by one side of the 2nd rectangular field contacting one side of the 1st rectangular field.

[Claim 5] The liquid crystal display according to claim 1 or 2 with which the 4th field on the insulating substrate with which the display electrode was formed which projects [at least] towards a way outside a substrate member from said 2nd field is characterized by being covered with said closure member.

[Claim 6] Said orientation film is a liquid crystal display according to claim 1 or 2 characterized by being formed on a surfactant layer.

[Translation done.]

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the comparatively small liquid crystal display especially used for a viewfinder, projection equipment, etc. of a video camera about the liquid crystal display which was excellent in display grace.
[0002]
[Description of the Prior Art] A liquid crystal display is constituted by the liquid crystal layer side front face of the liquid crystal layer which intervenes between the substrate member of a pair, and the substrate member concerned, and the substrate member of a pair including the closure member for closing the jointing material which forms the space where liquid crystal should be poured in, and the injected hole for liquid crystal impregnation, and said injected hole.
[0003] Drawing 10 is the top view showing gradually the creation approach of the conventional liquid crystal display 51, and drawing 11 is the sectional view. A liquid crystal display 51 is constituted including the substrate members 56 and 62, the liquid crystal layer 64, the jointing material 57, and the closure member 63 of a pair. The substrate members 56 and 62 of a pair have the translucency substrates 52 and 58, transparent electrodes 53 and 59, the surfactant layers 54 and 60, and the orientation film 55 and 61, respectively. On one side surface 52a of the translucency substrate 52 which is shown in drawing 1010 (1) and drawing 11 (1) and which has insulation at least, for example, is realized with glass, as shown in drawing 10 (2) and drawing 11 (2), the transparent electrode 53 for a display is formed, surfactants, such as a silane coupling agent, are applied further and the surfactant layer 54 is formed. The surfactant layer 54 is formed in order to improve adhesion with the orientation film 55, and the jointing material 57 and the translucency substrate 52 mentioned later.
[0004] Next, as shown in drawing 10 (3) and drawing 11 (3), the orientation film 55 is formed. The orientation film 55 forms polyimide resin all over surface-active-agent layer 54 front face with a spin coat method, and is created by performing orientation processing of rubbing processing etc. on the front face. Thus, on the other hand, the substrate member 56 is formed.
[0005] On the other hand, on the orientation film 55 of the substrate member 56, as shown in drawing 1010 (4) and drawing 11 (4), the jointing material 57 is applied by screen printing. The field of the method of the inside of a substrate of orientation film 55 front face surrounded by the jointing material 57 is the field 66 which forms the injected hole which is open for free passage to the field 65 which forms the space where liquid crystal should be poured in, i.e., a liquid crystal impregnation field, and the space

where said liquid crystal should be poured in, and pours liquid crystal into said space, i.e., an injected hole field. Furthermore, as said another side substrate member 62 which is formed like the substrate member 56 on the other hand, and has the translucency substrate 58, a transparent electrode 59, the surfactant layer 60, and the orientation film 61 was shown in drawing 10 (5), while said jointing material 57 was applied, they are the substrate member 56 and lamination ****. At this time, as the orientation film 55 of the substrate member 56 and the orientation film 61 of the another side substrate member 62 counter mutually on the other hand, they are lamination ****. Of this, the space where said liquid crystal should be poured in, and an injected hole are formed.

[0006] Liquid crystal is poured into the space where liquid crystal should be poured in from an injected hole, and the liquid crystal layer 64 is formed in it of this. If impregnation of liquid crystal is completed, the closure of the inlet port of said injected hole will be carried out by the closure member 63. Thus, the liquid crystal display 51 shown in drawing 10 (6) and drawing 11 (5) is completed.

[0007] Drawing 12 is the top view showing gradually the creation approach of other conventional liquid crystal displays 69, and drawing 13 is the sectional view. Since a liquid crystal display 69 is constituted almost like said liquid crystal display 51, it attaches and shows the same reference mark to the same configuration member. A liquid crystal display 69 is constituted including the substrate members 67 and 68 of a pair instead of the substrate members 56 and 62 of said pair. The substrate members 67 and 68 of a pair have the orientation film 70 and 71 instead of said orientation film 55 and 61, respectively.

[0008] On the other hand, a transparent electrode 53 and the surfactant layer 54 are formed in surface 52a the same with having mentioned [of the translucency substrate 52] above. Next, as shown in drawing 12 (1) and drawing 13 (1), the orientation film 70 is formed. Like said orientation film 55, polyimide resin realizes, and the orientation film 70 is formed in the field which forms the space where the polyimide resin concerned should be poured into liquid crystal by the typographic printing method, i.e., liquid crystal impregnation field 65a, and field 65b with which the part of the jointing material 57 mentioned later laps, and is created by performing orientation processing of rubbing processing etc. on the front face. Thus, on the other hand, the substrate member 67 is created.

[0009] On the other hand, on the surfactant layer 54 of the substrate member 67, and the orientation film 70, as shown in drawing 12 (2) and drawing 13 (2), the jointing material 57 is applied by screen printing. The jointing material 57 surrounds the orientation film 70 in general, and it superimposes it in part on the orientation film 70 so that it may be illustrated, namely, it superimposes only the part of field 65b except an injected hole field, and is formed. Thus, the example in which only a part superimposes and forms the jointing material 57 in the orientation film 70 is indicated by JP,63-8633,A. In addition, the fields of the method of the inside of a substrate of the orientation film 70 surrounded by the jointing material 57 and the surfactant layer 54 are the same liquid crystal impregnation field 65a as the above-mentioned, and the injected hole field 66.

[0010] Furthermore, said another side substrate member 68 which is created like the substrate member 67 on the other hand, and has the translucency substrate 58, a transparent electrode 59, the surfactant layer 60, and the orientation film 71 is the substrate member 67 and lamination ****, while said jointing material 57 was applied. At this time, as the orientation film 70 of the substrate member 67 and the orientation film 71 of the another side substrate member 68 counter mutually on the other hand, they are lamination ****. Of this, the space where said liquid crystal should be poured in, and an injected hole are formed. If liquid crystal is poured into the space where liquid crystal should be poured in like the above-mentioned, the liquid crystal layer 64 is formed in it and impregnation of liquid crystal is completed, the closure of the inlet port of said injected hole will be carried out by the closure member 63. Thus, the liquid crystal display 69 shown in drawing 12 (3) and drawing 13 (3) is completed.

[0011]

[Problem(s) to be Solved by the Invention] As an application of a liquid crystal display, besides the application over comparatively large-sized indicating equipments, such as portable television and a word processor, there is an application over comparatively small indicating equipments, such as a viewfinder

of a video camera and projection equipment, and what has the large rate of the viewing area to the gross area of equipment parallel to the screen of a liquid crystal display is desired in the latter. In such a small liquid crystal display, deterioration of the display grace by moisture absorption of orientation film which is mentioned later, and deterioration of the display grace by mixing of the impurity at the time of liquid crystal impregnation are remarkable as compared with a large-sized liquid crystal display, and the cure for raising display grace is needed.

[0012] As shown in drawing 10 and drawing 11 , when the orientation film 55 and 61 is formed all over the surfactant layers 54 and 60, on the other hand, the substrate member 56 and the another side substrate member 62 are formed in the jointing material 57 of a ********** sake in contact with the orientation film 55 and 61. In this case, since the adhesion of the orientation film 55 and the jointing material 57 is lower compared with the adhesion of the surfactant layer 54 and the jointing material 57, it is easy to produce exfoliation between the orientation film 55 and the jointing material 57. It is easy to produce exfoliation between the orientation film 61 and the jointing material 57 similarly about the another side substrate member 62 side.

[0013] Moreover, the polyimide resin used as orientation film 55 and 61 has comparatively high hygroscopicity, and the orientation film in contact with the atmospheric air formed in addition to liquid crystal impregnation field 65 and injected hole field 66 absorbs moisture the moisture in atmospheric air. If the moisture which absorbed moisture infiltrates into the liquid crystal layer 64, the fall of the electric resistance value of a liquid crystal ingredient will be caused, and the poor orientation of liquid crystal will occur, and display grace will fall. In order to prevent deterioration of such display grace, it must cope with carrying out the mold of the circumference of a liquid crystal display 51 which makes large width of face of the jointing material 57 with the silicon resin which is excellent in moisture resistance etc., and creation of a liquid crystal display 51 takes time and effort. Moreover, such a cure is disadvantageous in order to attain a miniaturization.

[0014] Furthermore, said polyimide resin is resin excellent in insulation, and when the orientation film 55 and 61 is formed all over the surfactant layers 54 and 60, in order to impress the electrical potential difference for a display to transparent electrodes 53 and 59, the removal processing which exfoliates the orientation film 55 and 61 of the periphery section of electrodes 53 and 59 is needed. Therefore, creation of a liquid crystal display 51 takes time and effort.

[0015] On the other hand, as shown in drawing 12 and drawing 13 , when the orientation film 70 and 71 is formed only in a predetermined field Since the orientation film 70 and 71 does not contact atmospheric air, while it can prevent moisture absorption of the polyimide resin used as orientation film 70 and 71, the jointing material 57 Since it has the part which is only overlapped on some orientation film 70 and 71, and contacts the surfactant layers 54 and 60, adhesion improves and it is hard coming to generate exfoliation.

[0016] However, if a liquid crystal injected hole is observed, since the orientation film 70 is not completely formed in the injected hole field 66, the liquid crystal poured in at the time of liquid crystal impregnation contacts the surfactant layer 54, and causes the fall of the electric resistance value of a liquid crystal ingredient by this, and the poor orientation of liquid crystal occurs, and display grace falls. It specifically decomposes at the time of baking after a surfactant applies polyimide resin (burning temperature: 180 degrees C - 250 degrees C), and it is thought that the electric resistance value of a liquid crystal ingredient falls with the pyrolysate produced at this time. Although the poor orientation of said liquid crystal is only near the injected hole, if it carries out long duration progress immediately after creation of a liquid crystal display 69, going on toward near the center of a viewing area is checked.

[0017] In fact, in order to secure dependability, the allowances of predetermined die length are given toward the method of the inside of a liquid crystal layer from the liquid crystal layer side edge section of the jointing material 57, and a viewing area is set up. Especially the die length L2 from the die length L1 from the edge by the side of the liquid crystal impregnation field 65 of the jointing material 57 of the side in which the injected hole was prepared in consideration of the poor orientation of liquid crystal which

was mentioned above to an actual viewing area, and the edge by the side of the liquid crystal impregnation field 65 of the jointing material 57 of the side in which the injected hole is not prepared to an actual viewing area is set up so that it may be set to L1>L2. Although it changes with magnitude of a liquid crystal display, it is set up so that the direction of die length L1 may become large 0.3mm – about 2mm. In order to secure the dependability of display grace, it becomes impossible therefore, to attain the miniaturization of a liquid crystal display. Especially in the comparatively small liquid crystal display used for a viewfinder, projection equipment, etc. of a video camera, since the effectiveness is large even if it is a little miniaturizations, to abolish allowances which took the poor orientation of liquid crystal into consideration and which were mentioned above is desired.

[0018] The purpose of this invention is offering the small liquid crystal display which was excellent in display grace.

[0019]

[Means for Solving the Problem] This invention intervenes between the liquid crystal layer which intervenes between the substrate member of the pair in which either has translucency at least, and the substrate member of a pair, and the substrate member of a pair. By the liquid crystal layer side front face of the substrate member of a pair It is constituted including the jointing material which forms the injected hole which is open for free passage to the space where liquid crystal should be poured in, and the space concerned, and the closure member which closes an injected hole. The substrate member of said pair In the liquid crystal display which has at least an insulating substrate, the display electrode formed in the liquid crystal layer side front face of the insulating substrate concerned, and the orientation film formed so that a liquid crystal layer may be contacted on the insulating substrate with which the display electrode concerned was formed, respectively Said orientation film is a liquid crystal display characterized by being prepared in the 2nd field in which an injected hole is formed of the 1st field in which the space on the insulating substrate with which the display electrode was formed where liquid crystal should be poured in by jointing material is formed at least, and jointing material. If this invention is followed, a liquid crystal layer and jointing material will be arranged between the substrate members of the pair arranged face to face. The substrate member of a pair has an insulating substrate, the display electrode formed in the liquid crystal layer side front face of the insulating substrate concerned, and the orientation film formed so that a liquid crystal layer may be contacted on the insulating substrate with which the display electrode concerned was formed, respectively, and either has translucency at least. The substrate member of a pair is arranged as the orientation film counters mutually. The injected hole which is open for free passage to the space where liquid crystal should be poured in, and the space concerned with the orientation film front face which is a liquid crystal layer side front face of the substrate member of a pair, and jointing material is formed. After the inlet port of an injected hole pours liquid crystal into said space, the closure of it is carried out by the closure member. Said orientation film is prepared in the 2nd field in which the injected hole which is open for free passage to the 1st field in which the space on the insulating substrate with which the display electrode was formed where liquid crystal should be poured in by jointing material is formed at least, and the space concerned is formed. The space and the injected hole into which liquid crystal should be poured are formed of an orientation film front face and jointing material, and jointing material contacts front faces other than the orientation film where adhesion is comparatively high by them. Therefore, the orientation film is created all over a substrate with a spin coat method, and the adhesion of jointing material and a substrate member improves as compared with the case where jointing material is prepared on the orientation film concerned. Moreover, since the orientation film does not contact atmospheric air, it can prevent the fall of the electric resistance value of the liquid crystal ingredient by moisture absorption of the moisture in atmospheric air. Furthermore, since the orientation film is formed also in the 2nd field which forms an injected hole, the impurity which reduces the electric resistance value of the liquid crystal concerned to liquid crystal at the time of liquid crystal impregnation does not mix, and the poor orientation of liquid crystal is not produced. Such a liquid crystal display does not

need to take into consideration deterioration of the display grace by mixing of an impurity, and, for this reason, can attain the miniaturization of a liquid crystal display. That is, when an actual viewing area opens predetermined spacing and is set up toward the method of the inside of a substrate from the liquid crystal layer side edge section of jointing material, in order to secure dependability, and take into consideration deterioration of the display grace especially by mixing of an impurity, the die length from the jointing material of the side in which the injected hole was prepared to a viewing area is choose for a long time than the die length from the jointing material of the side in which the injected hole is not prepare to a viewing area. However, in this invention, since it is not necessary to take into consideration deterioration of the display grace by mixing of an impurity, it becomes possible to be comparatively short, and to be all directions, and to make equal die length from jointing material to a viewing area. Therefore, display grace is excellent and a liquid crystal display with high still smaller dependability can be offered.

[0020] This invention intervenes between the liquid crystal layer which intervenes between the substrate member of the pair in which either has translucency at least, and the substrate member of a pair, and the substrate member of a pair. Moreover, by the liquid crystal layer side front face of the substrate member of a pair It is constituted including the jointing material which forms the injected hole which is open for free passage to the space where liquid crystal should be poured in, and the space concerned, and the closure member which closes an injected hole. The substrate member of said pair In the liquid crystal display which has at least an insulating substrate, the display electrode formed in the liquid crystal layer side front face of the insulating substrate concerned, and the orientation film formed so that a liquid crystal layer may be contacted on the insulating substrate with which the display electrode concerned was formed, respectively The 1st field in which the space on the insulating substrate with which, as for said orientation film, the display electrode was formed where liquid crystal should be poured in by jointing material is formed at least, It is the liquid crystal display characterized by being prepared in the 2nd field in which an injected hole is formed of jointing material, and the 3rd field which is a part of field where jointing material is arranged. If this invention is followed, said orientation film will be prepared in the 1st field in which the space on the insulating substrate with which the display electrode was formed where liquid crystal should be poured in by jointing material is formed at least, the 2nd field in which the injected hole which is open for free passage to the space concerned is formed, and the 3rd field which is a part of field where said jointing material is arranged. The space and the injected hole into which liquid crystal should be poured are formed of an orientation film front face and jointing material, and jointing material contacts front faces other than the orientation film where adhesion is comparatively high by them. Therefore, the orientation film is formed in the whole surface and the adhesion of jointing material and a substrate member improves as compared with the case where jointing material is prepared on it. Moreover, the orientation film does not contact atmospheric air but can prevent the fall of the electric resistance value of the liquid crystal ingredient by moisture absorption of the moisture in atmospheric air. Furthermore, the orientation film is formed also in the 2nd field which forms an injected hole, and the impurity which reduces an electric resistance value in a liquid crystal layer does not mix, and the poor orientation of liquid crystal is not produced. Such a liquid crystal display does not need to take into consideration deterioration of the display grace by mixing of an impurity, either, and, for this reason, can attain the miniaturization of a liquid crystal display. Therefore, display grace is excellent and a liquid crystal display with high still smaller dependability can be offered.

[0021] Moreover, as for this invention, the width of face D, jointing material, and orientation film of the field where said jointing material is arranged are characterized by choosing the width of face d of the 3rd overlapping field as the range of $D>d>0$. If this invention is followed, said jointing material and orientation film will be prepared as a part laps, and the width of face d of the 3rd field where the width of face D, jointing material, and orientation film of the field where said jointing material is arranged overlap will be chosen as the range of $D>d>0$. Since the injected hole which is open for free passage to the space

where liquid crystal should be poured in, and the space concerned is formed of an orientation film front face and jointing material and said width of face D and width of face d are chosen as the range of D> d>0, jointing material contacts other than [with comparatively high adhesion / at least a front face and a part of] the orientation film. Therefore, the adhesion of jointing material and a substrate member improves. Moreover, the fall of the electric resistance value of the liquid crystal ingredient by moisture absorption of the moisture in atmospheric air can be prevented. Furthermore, since the orientation film is formed also in the front face which forms an injected hole, the impurity which reduces the electric resistance value of the liquid crystal concerned to liquid crystal at the time of liquid crystal impregnation does not mix, and the poor orientation of liquid crystal is not produced. Therefore, display grace is excellent and a liquid crystal display with high still smaller dependability can be offered.

[0022] Moreover, the configuration of said 1st field is chosen as a rectangle, this invention is chosen as a rectangle with the configuration of the 2nd field smaller than the 1st field, and one side of the 2nd rectangular field is characterized by contacting one side of the 1st rectangular field. The orientation film will be formed in the 1st rectangular field and the 2nd rectangular field which were mentioned above at least if this invention is followed. Even if it is the case where the orientation film is formed in such a field, the adhesion of jointing material and a substrate member improves, the fall of the electric resistance value of a liquid crystal ingredient can be prevented, and the poor orientation of liquid crystal stops arising according to the operation mentioned above. For this reason, display grace is excellent, it is reliable and a small liquid crystal display can be offered.

[0023] Moreover, this invention is characterized by covering with said closure member the 4th field on the insulating substrate with which the display electrode was formed which projects [at least] towards a way outside a substrate member from said 2nd field. If this invention is followed, since the 4th field will be covered with a closure member, even if the orientation film is formed in the 4th field concerned, the orientation film concerned will be covered with a closure member, and can prevent further the fall of the electric resistance value of the liquid crystal ingredient by moisture absorption of the orientation film.

[0024] Moreover, this invention is characterized by forming said orientation film on a surfactant layer. If this invention is followed, said orientation film is formed on the surfactant layer. It improves and said surfactant layer raises the adhesion of the orientation film and jointing material, and the substrate with which these members are formed. By this invention, if it mixes into liquid crystal, although such a surfactant will reduce the electric resistance value of a liquid crystal ingredient, since the orientation film is formed also in the front face which forms an injected hole, a surfactant does not mix into liquid crystal and it can prevent the fall of an electric resistance value.

[0025]

[Embodiment of the Invention] Drawing 1 is the top view showing gradually the creation approach of the liquid crystal display 1 which is one gestalt of operation of this invention, and drawing 2 is the sectional view. A liquid crystal display 1 is constituted including the substrate members 6 and 12, the liquid crystal layer 14, the jointing material 7, and the closure member 13 of a pair. The substrate members 6 and 12 of a pair have the translucency substrates 2 and 8, transparent electrodes 3 and 9, the surfactant layers 4 and 10, and the orientation film 5 and 11, respectively. For example, when a liquid crystal display 1 is a liquid crystal display which performs color display of a active-matrix drive mold, one substrate member of the substrate members 6 and 12 of a pair has switching elements, such as an amorphous silicon TFT (thin film transistor) component, a poly-Si TFT component, or an MIM (metal-insulator layer-metal) component, and the substrate member of another side has a color filter. Moreover, the transparent electrode of the substrate member of the side which has a switching element turns into a pixel electrode prepared for every pixel, and the transparent electrode of the side which has a color filter turns into a common electrode.

[0026] On one side surface 2a of the translucency substrate 2 which is shown in drawing 1 (1) and drawing 2 (1) and which has insulation at least, for example, is realized with glass, as shown in drawing 1 (2) and drawing 2 R> 2 (2), the transparent electrode 3 for a display is formed, surfactants, such as a

silane coupling agent, are applied further and the surfactant layer 4 is formed. The surfactant layer 4 is formed in order to improve adhesion with the orientation film 5, and the jointing material 7 and the translucency substrate 2 mentioned later. For example, when a TFT component is prepared, inorganic substances, such as SiN, SiO, and ITO, are exposed to the front face of the translucency substrate 2. These have low adhesion with orientation film ingredients, such as polyimide. On the other hand, the functional group of the silane coupling agent molecule as said surface-active-agent layer 4 which is easy to combine with polyimide, such as a vinyl group and an alkoxy group, exists in an edge, and inorganic substances, such as an alkoxy group and a halogen, and a congenial functional group exist in an another side edge. For this reason, adhesion improves.

[0027] Next, as shown in drawing 1 (3) and drawing 2 (3), the orientation film 5 is formed. The orientation film 5 is realized by polyimide resin and the polyimide resin concerned is applied by typographic printing method which is mentioned later. The orientation film 5 is formed in 1st field 15a15 which forms the space where liquid crystal should be poured in at least, i.e., a liquid crystal impregnation field, and the 2nd field 16 16 which forms the injected hole which is open for free passage to said space, i.e., an injected hole field. Moreover, it is formed also in 3rd field 15b which is a part of field in which the jointing material 7 mentioned later, for example is formed. Orientation processing of rubbing processing etc. is performed to resin film front faces, such as polyimide applied by the typographic printing method, and it considers as the orientation film 5.

[0028] Moreover, preferably, the configuration of said 1st field 15a is chosen as a rectangle, and the configuration of the 2nd field 16 is chosen as a small rectangle from 1st field 15a. One-side 16a of the 2nd rectangular field 16 contacts one-side 15c of rectangular 1st field 15a. Thus, on the other hand, the substrate member 6 is formed.

[0029] On the other hand, on the surfactant layer 4 of the substrate member 6, and the orientation film 5, as shown in drawing 1 (4) and drawing 2 (4), the jointing material 7 realized by the epoxy system ultraviolet curing mold resin by which 5-micrometer glass fiber was mixed is applied by screen printing. The jointing material 7 is formed so that the orientation film 5 may be surrounded in general, and in consideration of the precision of the alignment of printing of the orientation film 5 and the jointing material 7, it superimposes on some orientation film 5, and it is formed so that it may be illustrated. When it is not necessary to take location precision into consideration, you may form so that it may not superimpose. In addition, the field of the method of the inside of the substrate surrounded by the jointing material 7 is the 2nd field 16 16 which forms the injected hole which is open for free passage to 1st field 15a15 which forms the space where liquid crystal should be poured in, i.e., a liquid crystal impregnation field, and the space where said liquid crystal should be poured in, and pours liquid crystal into said space, i.e., an injected hole field.

[0030] Furthermore, as said another side substrate member 12 which is created like the substrate member 6 on the other hand, and has the translucency substrate 8, a transparent electrode 9, the surfactant layer 10, and the orientation film 11 was shown in drawing 1 (5), while said jointing material 7 was applied, they are the substrate member 6 and lamination ****. At this time, as the orientation film 5 of the substrate member 6 and the orientation film 11 of the another side substrate member 12 counter mutually on the other hand, they are lamination ****. Moreover, conductive carbon is applied to the edge front face of the another side substrate member 12 using a dispenser etc. Thus, a pressure is put for spacing of lamination and the substrate members 6 and 12 concerned to become homogeneity about the substrate members 6 and 12 of a pair, and the jointing material 7 is stiffened. Of this, the space 18 where said liquid crystal should be poured in, and an injected hole 17 are formed.

[0031] Liquid crystal is poured into the space 18 where liquid crystal should be poured in from said injected hole 17, and the liquid crystal layer 14 is formed in it of this. If impregnation of liquid crystal is completed, the closure of the inlet port of said injected hole 17 will be carried out by the closure member 13 realized by epoxy system ultraviolet curing mold resin etc. That is, the 4th field 19 which projects towards a way outside the substrate members 6 and 12 from side 16b which counters said side

16a of the 2nd field 16 is covered with the closure member 13 at least. Thus, the liquid crystal display 1 shown in drawing 1 (6) and drawing 2 (5) is completed.

[0032] In addition, on the other hand with this gestalt, the substrate member 6 is larger than the another side substrate member 12. Therefore, on the other hand, the 4th field 19 is formed only in the substrate member 6, and this 4th field 19 is covered with the closure member 13 at least.

[0033] Drawing 3 is the top view showing the letterpress block copy 21 used in case polyimide resin is applied by the typographic printing method, and drawing 4 is a sectional view for explaining a typographic printing method. The letterpress block copy 21 is realized by the metal plate, and the orientation film pattern 22 equal to the configuration of the orientation film 5 and 11 is formed in the one side front face as heights for example, by the photolithography method. It is parallel to a longitudinal direction, and the orientation film pattern 22 is formed in the symmetry to the center line 35 of the used rectangle-like metal plate which divides a metal plate front face into two equally. At the time of Toppan Printing, the pattern of the orientation film for the letterpress block copy 21 being conveyed in the direction 23 parallel to a center line 35, for example, forming said injected hole in the conveyance direction downstream is arranged.

[0034] Such a letterpress block copy 21 is attached in the front face of the roller-like printing cylinder 30. At the time of Toppan Printing, the orientation film ingredient 27 is supplied at the rate defined beforehand from a dispenser 26, and, as for the orientation film ingredient 27 concerned, the amount of supply is further adjusted by a doctor roll 28 and the ANIROKUSU roll 29. As the front face of a doctor roll 28 and the front face of the ANIROKUSU roll 29 contact mutually, they are prepared, and each other are rotated to opposite directions 31 and 32, respectively. As the front face of a doctor roll 28 and the front face of the orientation film pattern 22 which was attached in the printing cylinder 30 and which is the heights of the letterpress block copy 21 contact mutually, they are prepared, and a doctor roll 28 and a printing cylinder 30 rotate each other to opposite directions 31 and 33, respectively. The orientation film ingredient 27 which the amount of supply was adjusted and adhered to the doctor roll 28 is imprinted by the front face of the orientation film pattern 22.

[0035] Moreover, the front face of the orientation film pattern 22 of the letterpress block copy 21 attached in the printing cylinder 30 and the front face of the substrate 25 which is laid on a stage 24 and should form the orientation film By being arranged as it contacts mutually, and a printing cylinder's 30 rotating to said hand of cut 33, and a stage's 24 moving in the direction 34 along the hand of cut 33 of a printing cylinder 30, and conveying said substrate 25 in the direction 34 concerned The orientation film ingredient 27 adhering to orientation film pattern 22 front face of the letterpress block copy 21 is imprinted by the front face of a substrate 25. Thus, after the orientation film ingredient 27 is applied, orientation processing is performed and the orientation film 5 and 11 is created.

[0036] With this gestalt, the orientation film pattern which serves as the orientation film 5 and 11 using the letterpress block copy 21 as shown in drawing 3 is formed. Since the location of the letterpress block copy 21 attached in a printing cylinder 30 and the location of the substrate 25 laid on a stage 24 are decided on beforehand, when both the orientation film 5 and 11 is formed using the letterpress block copy 21 which has the orientation film pattern 22 arranged to such a center line 35 at the symmetry, the injected hole 17 formed will be arranged in the center of the side of the side which formed the injected hole 17. Therefore, the orientation film 5 and 11 by the side of a mutually different substrate using the same letterpress block copy 21 can be formed, exchange of the letterpress block copy required when forming an injected hole 17 in the location [center] shifted becomes unnecessary, and productive efficiency improves.

[0037] Drawing 5 is the top view expanding and showing an injected hole 17, and drawing 6 is the sectional view of cutting plane line I-I. In this invention, if may form the jointing material 7 and the orientation film 5 and 11 so that it may lap partly, and you may prepare so that it may not lap, therefore width of face of the jointing material 7 is set to D and width of face of overlapping 3rd field 15b with the jointing material 7, the orientation film 5, or the orientation film 11 is set to d, it will be chosen as the

range of D>d>=0. Although width of face d= 0 is desirable, when applying the polyimide resin which serves as the orientation film 5 and 11 by typographic printing method which was mentioned above and applying the jointing material 7 with screen printing originally, it is desirable on both alignment precision to give some allowances. Therefore, the range of D>d>=0 which was mentioned above is chosen. For example, it is chosen as width of face of D= 1.2mm, and is chosen as width of face of d= 0.3mm. In this case, when alignment precision is **0.05mm, width of face d serves as the range of 0.2mm – 0.4mm.

[0038] In addition, as mentioned above, the 4th field 19 is covered by the closure member 13. Therefore, even if the orientation film 5 is formed also in the 4th field 19 which projects towards a way outside the substrate member 6 from the injected hole field 16 of one orientation film 5 in consideration of alignment precision which was mentioned above as shown in drawing 5 for example, the orientation film partial 5a concerned is covered with the closure member 13 which closes an injected hole 17. Therefore, the orientation film 5 does not contact atmospheric air and the fall of the electric resistance value of the liquid crystal by moisture absorption can be prevented.

[0039] Drawing 7 is the top view showing the viewing areas 37 and 43 actually set up. Drawing 7 (1) shows the liquid crystal display 1 of this gestalt, and drawing 7 (2) shows the conventional liquid crystal display 38. Although the conventional liquid crystal display 38 forms the orientation film by the typographic printing method, the orientation film is not prepared in the field 16 which forms an injected hole. A viewing area gives the allowances of the die length beforehand defined toward the method of the inside of a liquid crystal layer from the liquid crystal layer side edge section of jointing material in the space where liquid crystal should be poured in, and is set up. The die length L1 from the liquid crystal layer side edge section of the jointing material 7 of the side in which the injected hole 17 was formed in the case of this gestalt to a viewing area 37 becomes possible [making it the same die length as the die length L2–L4 from the liquid crystal layer side edge section of the jointing material 7 of the side in which the injected hole 17 is not formed to a viewing area 37]. For example, both the die length L1–L4 is chosen as 0.05mm or more.

[0040] On the other hand, in the case of the conventional liquid crystal display 38, in order to prevent the effect of impurities, such as a surfactant mixed in liquid crystal in injected hole 44 part at the time of liquid crystal impregnation, said die length L1 is chosen more greatly than die length L2–L4. For this reason, a liquid crystal display 38 becomes comparatively large.

[0041] The lay length A1 perpendicular to the near side in which in the case of this gestalt it is the die length between the liquid crystal layer side edge sections of the jointing material 7, and the injected hole 17 was formed For example, the die length A2 of the same viewing area 37 of a direction as 15.8mm For example, the same die–length B–2 of the viewing area 37 of a direction as 12.0mm is chosen as 10.4mm for the lay length B1 parallel to the near side where it is the die length between the liquid crystal layer side edge sections of the jointing material 7, and the injected hole 17 was formed in 14.2mm, respectively. the case A1 of the conventional liquid crystal display 38, for example, said die length, -- 16.3mm -- said die length B1 is chosen as 12.0mm, and said die–length B–2 is chosen as 14.2mm for said die length A2 by 10.4mm, respectively. Thus, die length A1 can be reduced only by 0.5mm, making magnitude of viewing areas 37 and 43 the same. The effectiveness in the case of this reduced die length hitting to about 3% to A1=15.8mm, for example, realizing a miniaturization further in comparatively small liquid crystal displays, such as a viewfinder and a liquid crystal display for projection equipments, is large.

[0042] Then, the result of having evaluated the electrical–potential–difference retention of the liquid crystal display of this gestalt and the liquid crystal display of the conventional technique and extent of poor orientation is explained. Drawing 8 and drawing 9 are the top views showing the electrode configuration of the liquid crystal display for evaluation used for this evaluation. In addition, the same reference mark is attached and shown in the same configuration member as a liquid crystal display 1 all over drawing. The transparent electrodes 3a–3c of the liquid crystal display for evaluation prepared instead of said transparent electrode 3 by the side of the substrate member 6 on the other hand are formed in three places along the direction of grouting S of liquid crystal, respectively. either of the two

substrate edges where the substrate edge by the side of an injected hole 17 and transparent electrodes 3a-3c cross at right angles -- it is pulled out at the substrate edge side. moreover, transparent electrode 9a by the side of the another side substrate member 12 -- the translucency substrate 8 -- it is mostly formed in the whole surface.

[0043] The evaluation result of electrical-potential-difference retention is shown in Table 1. Moreover, the die length of a poor orientation field is shown in Table 2. As the result about the liquid crystal display which formed the orientation film in the liquid crystal impregnation field 15 and the injected hole field 16 like this gestalt is shown as (a) and it is shown in drawing 12 and drawing 13 As the result about the liquid crystal display which formed the orientation film in a part of liquid crystal impregnation field 15 and injected hole field 16 is shown as (b) and it is shown in drawing 10 and drawing 11 The result about the liquid crystal display of the translucency substrate with which the transparent electrode was formed which formed the orientation film in the whole surface mostly is shown as (c). Moreover, the result of the electrical-potential-difference retention of transparent electrode 3a formed in a different location which was mentioned above - 3c parts is shown as **, **, and ** in order, respectively. In addition, to the equipment held at the 25-degree C environment, the electrical potential difference of the square wave of 60Hz and **5V was impressed, and the electrical-potential-difference retention immediately after creation and the electrical-potential-difference retention after aging driven under the environment of 60 degrees C and 95%RH for 500 hours were measured. Furthermore, wx, y, and z show the die length of a poor orientation field, respectively as die length from the jointing material [7a-7d] liquid crystal layer side edge section shown in drawing 9 . In the jointing material 7a-7d, the part of the jointing material 7 by the side of the injected hole 17 which counters the side by which transparent electrodes 3a-3c were pulled out is pointed [injected hole / 17] out the side by which the opposite side and said transparent electrodes 3a-3c were pulled out.

[0044]

[Table 1]

作成条件	測定位置	電圧保持率（%） エージング時間	
		初 期	500時間
(a)	①	99.3	99.0
	②	99.4	99.1
	③	99.3	99.0
(b)	①	99.4	98.7
	②	99.2	98.1
	③	98.5	97.5
(c)	①	99.4	98.5
	②	99.3	99.0
	③	99.2	98.3

[0045]

[Table 2]

作成条件	測定位置	配向不良領域（mm） エージング時間	
		初 期	500時間
(a)	w	0.0	0.04
	x	0.0	0.05
	y	0.0	0.05
	z	0.0	0.06
(b)	w	0.0	0.05
	x	0.0	0.06
	y	0.0	0.06
	z	0.05	0.25
(c)	w	0.0	0.09
	x	0.0	0.11
	y	0.0	0.10
	z	0.0	0.12

[0046] It turns out that electrical-potential-difference retention has [all other parts] the transparent electrode 3c part (**) as low as 98.5% which touches the injected hole 17 of the liquid crystal display (b) which formed the orientation film in a part of liquid crystal impregnation field 15 and injected hole field 16 immediately after creation recently to being 99% or more. It is related with the liquid crystal display (a) which formed the orientation film in the liquid crystal impregnation field 15 and the injected hole field 16 after aging. Also about which part (**-**) of transparent electrodes 3a-3c, decline in electrical-potential-difference retention is seen about other liquid crystal displays (b) and (c) to holding 99% or more in the part of either of the transparent electrodes 3a-3c.

[0047] Moreover, immediately after creation, it is a liquid crystal display (b), poor orientation is generated into the part (z) of 7d of adhesion members by the side of an injected hole 17, and poor orientation is produced into neither of the parts, parts (wx, y) other than jointing material 7d of the equipment (b) concerned and other liquid crystal displays (a), nor (c). It turns out that poor orientation is generated also about which part (wx, y, z) after aging, also concerning which liquid crystal display (a) - (c). However, the die length of the field which has produced poor orientation is understood that a liquid crystal display (a) is the smallest.

[0048] Thus, the display grace which the liquid crystal display of this gestalt had little decline in electrical-potential-difference retention, and extent of a poor display also had, and was excellent is acquired. [of the liquid crystal display] [comparatively small]

[0049] As mentioned above, according to this gestalt, since they are prepared as compared with the orientation film 5 and 11 as at least the surfactant layers 4 and 10 and a part of high adhesion laps, adhesion of jointing material 7 improves as compared with the case where the orientation film is prepared in the whole surface with a spin coat method, and exfoliation of it between the jointing material 7 and the orientation film 5 and 11 is lost. Moreover, since the orientation film 5 and 11 does not contact atmospheric air, it can prevent that the electric resistance value of the liquid crystal by moisture absorption of the moisture in atmospheric air falls. Furthermore, since the orientation film 5 and 11 is formed also in the injected hole field 16 which forms an injected hole 17, it is lost that impurities, such as a surfactant, mix in liquid crystal at the time of liquid crystal impregnation, and the electric resistance value of liquid crystal falls.

[0050] Therefore, it becomes possible to become unnecessary to take into consideration deterioration of the display grace by mixing of an impurity, and to attain the miniaturization of a liquid crystal display. This becomes remarkable [the effectiveness] in the comparatively small liquid crystal displays a viewfinder, for projection equipments, etc. Moreover, if magnitude of a liquid crystal display is made the same, it will become possible to aim at expansion of a viewing area.

[0051] in addition, in order to make into the minimum liquid crystal which adheres near the injected hole [also although kicked, set to a comparatively large-sized liquid crystal display, and] at the time of liquid crystal impregnation which arranges the injected hole 17 in the center of the side by the side of an injected hole in order to form the orientation film 5 and 11 with this gestalt using the same letterpress block copy 21 and to improve productive efficiency, it is also possible to arrange an injected hole to the corner of a liquid crystal display. By arranging an injected hole to a corner, the field immersed during the liquid crystal bath which filled the liquid crystal which should be poured in can be lessened, and coating weight decreases. For this reason, the activity which removes the adhering liquid crystal can carry out in a short time. In the case of a small liquid crystal display, since it is small, there is little coating weight fundamentally, and since removal of the adhering liquid crystal can be performed in a short time, to it, it is possible to arrange an injected hole 17 in the center like this gestalt.

[0052] Moreover, even if this invention is the case where what enlarged the rate of the viewing area to the gross area of equipment parallel to the screen of not only a small liquid crystal display but a large-sized liquid crystal display, especially a liquid crystal display, i.e., the circumference part of a viewing area, is carried out in the narrowed liquid crystal display, the same effectiveness is acquired and its

display grace improves.

[0053]

[Effect of the Invention] As mentioned above, according to this invention, since jointing material is prepared as it contacts front faces other than the orientation film where adhesion is comparatively high, its adhesion of jointing material improves. Moreover, since the orientation film does not contact atmospheric air, it can prevent the fall of the electric resistance value of the liquid crystal by moisture absorption. Furthermore, since the orientation film is formed also in the front face which forms an injected hole, it can prevent that impurities, such as a surfactant to which the electric resistance value of liquid crystal is reduced at the time of liquid crystal impregnation, mix in liquid crystal.

[0054] Therefore, spacing of the jointing material and viewing area which it becomes unnecessary to have taken into consideration deterioration of the display grace by mixing of an impurity, and had been prepared in consideration of deterioration of said display grace can be made small, and it becomes possible to attain the miniaturization of a liquid crystal display.

[0055] Moreover, according to this invention, jointing material is prepared as it contacts other than [with comparatively high adhesion / at least a front face and a part of] the orientation film. Therefore, the same with having mentioned above, the adhesion of jointing material can improve, the fall of the electric resistance value of liquid crystal can be prevented, and the miniaturization of a liquid crystal display can be attained.

[0056] Moreover, according to this invention, the width of face d of the field of jointing material and the orientation film with which it laps is chosen so that it may become the range of D>d>0. Therefore, at least a front face and a part with comparatively high adhesion contact, and adhesion of jointing material improves.

[0057] Moreover, according to this invention, the 1st and 2nd fields are chosen as a rectangle. Even if it is a time of forming the orientation film in such a field, the adhesion of jointing material improves.

[0058] Moreover, since the orientation film concerned is covered with a closure member even if for example, the orientation film is formed in the 4th field which projects towards a way outside a substrate member from the 2nd field which forms an injected hole according to this invention, the fall of the electric resistance value of the liquid crystal by moisture absorption can be prevented.

[0059] Furthermore, according to this invention, said orientation film is formed on a surfactant layer. Adhesion with the substrate with which the orientation film and jointing material, and these members are formed of this surfactant layer improves. Since the orientation film is formed in the front face which forms an injected hole even if it prepares such a surfactant layer, a surfactant does not mix in liquid crystal at the time of liquid crystal impregnation.

[Translation done.]

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is the top view showing gradually the creation approach of the liquid crystal display 1 which is one gestalt of operation of this invention.
[Drawing 2] It is the sectional view showing gradually the creation approach of said liquid crystal display 1.
[Drawing 3] It is the top view showing the letterpress block copy 21 used at the time of Toppan Printing.
[Drawing 4] It is a sectional view for explaining a typographic printing method.
[Drawing 5] It is the top view expanding and showing an injected hole 17.
[Drawing 6] It is a sectional view when cutting said injected hole 17 by cutting plane line I–I.
[Drawing 7] It is the top view showing viewing areas 37 and 43.
[Drawing 8] It is the top view showing the electrode configuration of the liquid crystal display used in order to evaluate extent of electrical–potential–difference retention and poor orientation.
[Drawing 9] It is the top view showing the electrode configuration of the liquid crystal display used in order to evaluate extent of electrical–potential–difference retention and poor orientation.
[Drawing 10] It is the top view showing gradually the creation approach of the conventional liquid crystal display 51.
[Drawing 11] It is the sectional view showing gradually the creation approach of said liquid crystal display 51.
[Drawing 12] It is the top view showing gradually the creation approach of other conventional liquid crystal displays 69.
[Drawing 13] It is the sectional view showing gradually the creation approach of said liquid crystal display 69.
[Description of Notations]
1 Liquid Crystal Display
2 Eight Translucency substrate
3 Nine Transparent electrode
4 Ten Surfactant layer
5 11 Orientation film
6 On the Other Hand, it is Substrate Member.
7 Jointing Material
12 Another Side Substrate Member
13 Closure Member
14 Liquid Crystal Layer
15 Liquid Crystal Impregnation Field
16 Injected Hole Field
17 Injected Hole

[Translation done.]

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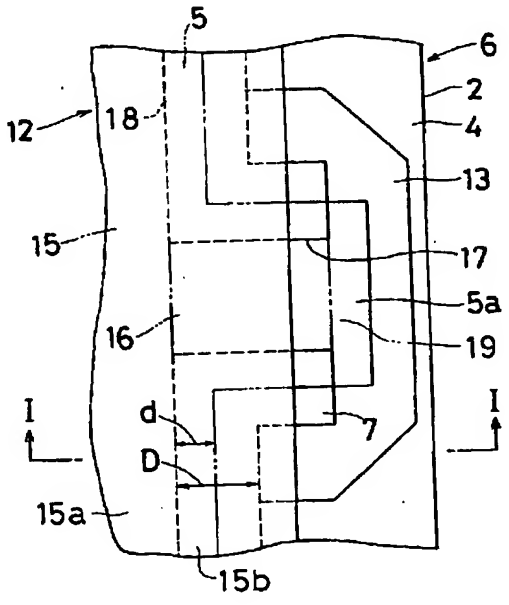
(54)【発明の名称】　液晶表示装置

(57)【要約】
【課題】　表示品位の優れた小形の液晶表示装置を提供する。
【解決手段】　透光性基板２上に透明電極と界面活性剤層とが形成された後、配向膜５が形成されて一方基板部材６が構成される。配向膜５は、液晶注入領域１５である領域１５ａと注入孔領域１６と接着部材７が形成される領域の一部分である領域１５ｂとに形成される。一方基板部材６の配向膜５上に塗布された接着部材７、配向膜５および他方基板部材の配向膜によって形成される空間は、液晶が注入されて液晶層となる空間１８と、空間１８に連通して当該空間１８に液晶を注入する注入孔１７とになる。接着部材７の幅Ｄと、接着部材７と配向膜５との重なる領域１５ｂの幅ｄとはＤ＞ｄ≧０の範囲に選ばれる。一対の基板部材が貼合わせられて注入孔１７から液晶が注入された後、注入孔１７の入口が封止部材１３によって封止される。



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【特許請求の範囲】

【請求項１】　少なくともいずれか一方が透光性を有する一対の基板部材と、一対の基板部材間に介在される液晶層と、

一対の基板部材間に介在され、一対の基板部材の液晶層側表面とによって、液晶が注入されるべき空間および当該空間に連通する注入孔を形成する接着部材と、

注入孔を封止する封止部材とを含んで構成され、

前記一対の基板部材は、絶縁性基板と、当該絶縁性基板の液晶層側表面に形成される表示電極と、当該表示電極が形成された絶縁性基板上に液晶層に接触するように形成される配向膜とを、少なくともそれぞれ有する液晶表示装置において、

前記配向膜は、表示電極が形成された絶縁性基板上の少なくとも、接着部材とによって液晶が注入されるべき空間が形成される第１領域と、接着部材とによって注入孔が形成される第２領域とに設けられることを特徴とする液晶表示装置。

【請求項２】　少なくともいずれか一方が透光性を有する一対の基板部材と、一対の基板部材間に介在される液晶層と、

一対の基板部材間に介在され、一対の基板部材の液晶層側表面とによって、液晶が注入されるべき空間および当該空間に連通する注入孔を形成する接着部材と、

注入孔を封止する封止部材とを含んで構成され、

前記一対の基板部材は、絶縁性基板と、当該絶縁性基板の液晶層側表面に形成される表示電極と、当該表示電極が形成された絶縁性基板上に液晶層に接触するように形成される配向膜とを、少なくともそれぞれ有する液晶表示装置において、

前記配向膜は、表示電極が形成された絶縁性基板上の少なくとも、接着部材とによって液晶が注入されるべき空間が形成される第１領域、接着部材とによって注入孔が形成される第２領域、および接着部材が配置される領域の一部分である第３領域に設けられることを特徴とする液晶表示装置。

【請求項３】　前記接着部材が配置される領域の幅Ｄと、接着部材と配向膜とが重なり合う第３領域の幅ｄとは、Ｄ＞ｄ＞０の範囲に選ばれることを特徴とする請求項２記載の液晶表示装置。

【請求項４】　前記第１領域の形状は矩形に選ばれ、第２領域の形状は第１領域よりも小さい矩形に選ばれ、矩形の第２領域の一辺は、矩形の第１領域の一辺と当接することを特徴とする請求項１または２記載の液晶表示装置。

【請求項５】　表示電極が形成された絶縁性基板上の、少なくとも前記第２領域から基板部材の外方に向けて突出する第４領域が、前記封止部材によって覆われていることを特徴とする請求項１または２記載の液晶表示装置。

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【請求項６】　前記配向膜は、界面活性剤層上に形成されていることを特徴とする請求項１または２記載の液晶表示装置。

【発明の詳細な説明】

【０００１】

【発明の属する技術分野】本発明は、表示品位の優れた液晶表示装置に関し、特にビデオカメラのビューファインダやプロジェクション装置などに用いられる比較的小形の液晶表示装置に関する。

【０００２】

【従来の技術】液晶表示装置は、一対の基板部材、当該基板部材間に介在される液晶層、一対の基板部材の液晶層側表面とによって液晶が注入されるべき空間と液晶注入用の注入孔とを形成する接着部材、および前記注入孔を封止するための封止部材を含んで構成される。

【０００３】図１０は、従来の液晶表示装置５１の作成方法を段階的に示す平面図であり、図１１はその断面図である。液晶表示装置５１は、一対の基板部材５６，６２、液晶層６４、接着部材５７および封止部材６３を含んで構成される。一対の基板部材５６，６２は、透光性基板５２，５８、透明電極５３，５９、界面活性剤層５４，６０および配向膜５５，６１をそれぞれ有する。図１０（１）および図１１（１）に示される少なくとも絶縁性を有し、たとえばガラスで実現される透光性基板５２の一方表面５２ａ上には、図１０（２）および図１１（２）に示されるように、表示用の透明電極５３が形成され、さらにシランカップリング剤などの界面活性剤が塗布されて界面活性剤層５４が形成される。界面活性剤層５４は、後述する配向膜５５および接着部材５７と透光性基板５２との密着性を改善するために設けられる。

【０００４】次に、図１０（３）および図１１（３）に示されるように配向膜５５が形成される。配向膜５５は、たとえばポリイミド樹脂をスピンコート法によって界面活性剤層５４表面の全面に形成し、その表面にラビング処理などの配向処理を行うことによって作成される。このようにして一方基板部材５６が形成される。

【０００５】一方基板部材５６の配向膜５５上には、図１０（４）および図１１（４）に示されるように接着部材５７がスクリーン印刷法によって塗布される。接着部材５７によって囲まれる配向膜５５表面の基板内方の領域は、液晶が注入されるべき空間を形成する領域、すなわち液晶注入領域６５、および前記液晶が注入されるべき空間に連通し、液晶を前記空間に注入する注入孔を形成する領域、すなわち注入孔領域６６である。さらに、前記一方基板部材５６と同様にして形成され、透光性基板５８、透明電極５９、界面活性剤層６０および配向膜６１を有する他方基板部材６２が、図１０（５）に示されるように、前記接着部材５７が塗布された一方基板部材５６と貼合わせられる。このとき、一方基板部材５６の配向膜５５と、他方基板部材６２の配向膜６１とが互

いに対向するようにして貼合わせられる。これによって、前記液晶が注入されるべき空間と、注入孔とが形成される。

【０００６】液晶が注入されるべき空間には、注入孔から液晶が注入され、これによって液晶層６４が形成される。液晶の注入が完了すると、前記注入孔の入口は封止部材６３によって封止される。このようにして図１０（６）および図１１（５）に示される液晶表示装置５１が完成する。

【０００７】図１２は、従来の他の液晶表示装置６９の作成方法を段階的に示す平面図であり、図１３はその断面図である。液晶表示装置６９は、前記液晶表示装置５１とほぼ同様にして構成されるので、同様の構成部材には同じ参照符号を付して示す。液晶表示装置６９は、前記一対の基板部材５６，６２に代わって一対の基板部材６７，６８を含んで構成される。一対の基板部材６７，６８は、前記配向膜５５，６１に代わって配向膜７０，７１をそれぞれ有する。

【０００８】透光性基板５２の一方表面５２ａには、前述したのと同様に透明電極５３および界面活性剤層５４が形成される。次に、図１２（１）および図１３（１）に示されるように配向膜７０が形成される。配向膜７０は、前記配向膜５５と同様に、たとえばポリイミド樹脂で実現され、当該ポリイミド樹脂を凸版印刷法によって液晶が注入されるべき空間を形成する領域、すなわち液晶注入領域６５ａと、後述する接着部材５７の部分が重なる領域６５ｂとに形成し、その表面にラビング処理などの配向処理を行うことによって作成される。このようにして一方基板部材６７が作成される。

【０００９】一方基板部材６７の界面活性剤層５４および配向膜７０上には図１２（２）および図１３（２）に示されるように、接着部材５７がスクリーン印刷法によって塗布される。接着部材５７は、概ね配向膜７０を囲み、かつ図示されるように配向膜７０の上に一部分重畳して、すなわち注入孔領域を除く領域６５ｂの部分だけ重畳して形成される。このように、接着部材５７を配向膜７０に一部分だけ重畳して形成する例は、特開昭６３－８６３３号公報に開示されている。なお、接着部材５７によって囲まれる配向膜７０および界面活性剤層５４の基板内方の領域は、前述と同様の液晶注入領域６５ａおよび注入孔領域６６である。

【００１０】さらに、前記一方基板部材６７と同様にして作成され、透光性基板５８、透明電極５９、界面活性剤層６０および配向膜７１を有する他方基板部材６８が、前記接着部材５７が塗布された一方基板部材６７と貼合わせられる。このとき、一方基板部材６７の配向膜７０と、他方基板部材６８の配向膜７１とが互いに対向するようにして貼合わせられる。これによって、前記液晶が注入されるべき空間と、注入孔とが形成される。液晶が注入されるべき空間には、前述と同様にして液晶が

注入されて液晶層６４が形成され、液晶の注入が完了すると、前記注入孔の入口が封止部材６３によって封止される。このようにして、図１２（３）および図１３（３）に示される液晶表示装置６９が完成する。

【００１１】

【発明が解決しようとする課題】液晶表示装置の用途としては、携行用テレビジョンやワードプロセッサなどの比較的大形の表示装置に対する用途の他に、ビデオカメラのビューファインダやプロジェクション装置などの比較的小形の表示装置に対する用途があり、後者においては、液晶表示装置の表示面に平行な装置の総面積に対する表示領域の割合が大きいものが望まれる。このような小形の液晶表示装置では、後述するような配向膜の吸湿による表示品位の低下や、液晶注入時の不純物の混入による表示品位の低下は、大形の液晶表示装置と比較して顕著であり、表示品位を向上させるための対策が必要となる。

【００１２】図１０および図１１に示されるように、配向膜５５，６１を界面活性剤層５４，６０の全面に形成した場合には、一方基板部材５６と他方基板部材６２とを貼合わせるための接着部材５７は、配向膜５５，６１に接して設けられる。この場合、界面活性剤層５４と接着部材５７との密着性に比べて、配向膜５５と接着部材５７との密着性の方が低いので、配向膜５５と接着部材５７との間で剥離が生じやすい。他方基板部材６２側についても同様に配向膜６１と接着部材５７との間で剥離が生じやすい。

【００１３】また、配向膜５５，６１として用いられるポリイミド樹脂は、比較的吸湿性が高く、液晶注入領域６５および注入孔領域６６以外に形成された大気に接触する配向膜は大気中の水分を吸湿する。吸湿した水分が液晶層６４に浸入すると、液晶材料の電気抵抗値の低下を招き、また液晶の配向不良が発生して表示品位が低下する。このような表示品位の低下を防止するためには、たとえば接着部材５７の幅を広くする、液晶表示装置５１の周辺を耐湿性に優れるシリコン樹脂などでモールドするなどの対策を施さなければならず、液晶表示装置５１の作成に手間がかかる。また、このような対策は小形化を図るためには不利である。

【００１４】さらに、前記ポリイミド樹脂は絶縁性に優れた樹脂であり、界面活性剤層５４，６０の全面に配向膜５５，６１を設けた場合、透明電極５３，５９に表示のための電圧を印加するためには、電極５３，５９の周縁部の配向膜５５，６１を剥離する除去処理が必要となる。したがって、液晶表示装置５１の作成に手間がかかる。

【００１５】一方、図１２および図１３に示されるように、所定の領域のみに配向膜７０，７１を形成した場合には、配向膜７０，７１が大気に接触しないので、配向膜７０，７１として用いるポリイミド樹脂の吸湿を防止

することができるとともに、接着部材５７は、配向膜７０，７１の一部分に重畳しているだけであり、界面活性剤層５４，６０と接触する部分を有しているので、密着性が向上して剥離が生じにくくなる。

【００１６】しかしながら、液晶注入孔に注目すると、注入孔領域６６には完全に配向膜７０が形成されていないので、液晶注入時において注入される液晶が界面活性剤層５４と接触し、これによって液晶材料の電気抵抗値の低下を招き、また液晶の配向不良が発生して表示品位が低下する。具体的には、界面活性剤がポリイミド樹脂を塗布した後の焼成時（焼成温度：１８０℃～２５０℃）において分解し、このときに生じる熱分解生成物によって液晶材料の電気抵抗値が低下すると考えられる。前記液晶の配向不良は、液晶表示装置６９の作成直後では注入孔近傍のみであるけれども、長時間経過すると表示領域の中央付近に向かって進行していくことが確認されている。

【００１７】実際には、信頼性を確保するために接着部材５７の液晶層側端部から液晶層内方に向かって所定の長さの余裕を持たせて表示領域が設定される。特に、上述したような液晶の配向不良を考慮して、注入孔が設けられた側の接着部材５７の液晶注入領域６５側の端部から実際の表示領域までの長さＬ１と、注入孔が設けられていない側の接着部材５７の液晶注入領域６５側の端部から実際の表示領域までの長さＬ２とは、Ｌ１＞Ｌ２となるように設定される。液晶表示装置の大きさによって異なるけれども、たとえば長さＬ１の方が０．３mm～２mm程度大きくなるように設定される。したがって、表示品位の信頼性を確保するために液晶表示装置の小形化が図れなくなる。特に、ビデオカメラのビューファインダやプロジェクション装置などに用いられる比較的小形の液晶表示装置では、少しの小形化であってもその効果は大きいので、液晶の配向不良を考慮した上述したような余裕をなくすことが望まれる。

【００１８】本発明の目的は、表示品位の優れた小形の液晶表示装置を提供することである。

【００１９】

【課題を解決するための手段】本発明は、少なくともいずれか一方が透光性を有する一対の基板部材と、一対の基板部材間に介在される液晶層と、一対の基板部材間に介在され、一対の基板部材の液晶層側表面とによって、液晶が注入されるべき空間および当該空間に連通する注入孔を形成する接着部材と、注入孔を封止する封止部材とを含んで構成され、前記一対の基板部材は、絶縁性基板と、当該絶縁性基板の液晶層側表面に形成される表示電極と、当該表示電極が形成された絶縁性基板上に液晶層に接触するように形成される配向膜とを、少なくともそれぞれ有する液晶表示装置において、前記配向膜は、表示電極が形成された絶縁性基板上の少なくとも、接着部材とによって液晶が注入されるべき空間が形成される

第１領域と、接着部材とによって注入孔が形成される第２領域とに設けられることを特徴とする液晶表示装置である。

本発明に従えば、対向して配置される一対の基板部材間には液晶層と接着部材とが配置される。一対の基板部材は、絶縁性基板と、当該絶縁性基板の液晶層側表面に形成される表示電極と、当該表示電極が形成された絶縁性基板上に液晶層に接触するように形成される配向膜とをそれぞれ有し、少なくともいずれか一方が透光性を有する。一対の基板部材は配向膜が互いに対向するようにして配置される。一対の基板部材の液晶層側表面である配向膜表面と接着部材とによって、液晶が注入されるべき空間と当該空間に連通する注入孔とが形成される。注入孔の入口は、液晶を前記空間に注入した後に封止部材によって封止される。前記配向膜は、表示電極が形成された絶縁性基板上の少なくとも、接着部材とによって液晶が注入されるべき空間が形成される第１領域および当該空間に連通する注入孔が形成される第２領域に設けられる。

配向膜表面と接着部材とによって液晶が注入されるべき空間と注入孔とが形成され、接着部材は配向膜以外の比較的密着性の高い表面と接触する。したがって、スピンコート法で基板全面に配向膜を作成し、当該配向膜上に接着部材を設けた場合と比較して、接着部材と基板部材との密着性が向上する。また、配向膜は大気に接触しないので、大気中の水分の吸湿による液晶材料の電気抵抗値の低下が防止できる。さらに、注入孔を形成する第２領域にも配向膜が形成されるので、液晶注入時において液晶に当該液晶の電気抵抗値を低下させる不純物が混入せず、また液晶の配向不良も生じない。

このような液晶表示装置は、不純物の混入による表示品位の低下を考慮しなくてもよく、このため液晶表示装置の小形化を図ることができる。すなわち、実際の表示領域は、信頼性を確保するために接着部材の液晶層側端部から基板内方に向かって所定の間隔をあけて設定され、特に不純物の混入による表示品位の低下を考慮する場合には、注入孔が設けられた側の接着部材から表示領域までの長さは、注入孔が設けられていない側の接着部材から表示領域までの長さよりも長く選ばれる。しかしながら本発明では、不純物の混入による表示品位の低下を考慮しなくてもよいので、接着部材から表示領域までの長さを比較的短く、かつすべての方向で等しくすることが可能となる。

したがって、表示品位が優れ、信頼性が高く、さらに小形の液晶表示装置を提供することができる。

【００２０】また本発明は、少なくともいずれか一方が透光性を有する一対の基板部材と、一対の基板部材間に介在される液晶層と、一対の基板部材間に介在され、一対の基板部材の液晶層側表面とによって、液晶が注入されるべき空間および当該空間に連通する注入孔を形成す

る接着部材と、注入孔を封止する封止部材とを含んで構成され、前記一対の基板部材は、絶縁性基板と、当該絶縁性基板の液晶層側表面に形成される表示電極と、当該表示電極が形成された絶縁性基板上に液晶層に接触するように形成される配向膜とを、少なくともそれぞれ有する液晶表示装置において、前記配向膜は、表示電極が形成された絶縁性基板上の少なくとも、接着部材とによって液晶が注入されるべき空間が形成される第１領域、接着部材とによって注入孔が形成される第２領域、および接着部材が配置される領域の一部分である第３領域に設けられることを特徴とする液晶表示装置である。

本発明に従えば、前記配向膜は、表示電極が形成された絶縁性基板上の少なくとも、接着部材とによって液晶が注入されるべき空間が形成される第１領域、当該空間に連通する注入孔が形成される第２領域、および前記接着部材が配置される領域の一部分である第３領域に設けられる。配向膜表面と接着部材とによって液晶が注入されるべき空間と注入孔とが形成され、接着部材は配向膜以外の比較的密着性の高い表面と接触する。したがって、配向膜を全面に形成し、その上に接着部材を設けた場合と比較して、接着部材と基板部材との密着性が向上する。また、配向膜は大気に接触せず、大気中の水分の吸湿による液晶材料の電気抵抗値の低下が防止できる。さらに、注入孔を形成する第２領域にも配向膜が形成され、液晶層に電気抵抗値を低下させる不純物が混入せず、また液晶の配向不良も生じない。

このような液晶表示装置も、不純物の混入による表示品位の低下を考慮しなくてもよく、このため液晶表示装置の小形化を図ることができる。したがって、表示品位が優れ、信頼性が高く、さらに小形の液晶表示装置を提供することができる。

【００２１】また本発明は、前記接着部材が配置される領域の幅Ｄと、接着部材と配向膜とが重なり合う第３領域の幅ｄとは、Ｄ＞ｄ＞０の範囲に選ばれることを特徴とする。

本発明に従えば、前記接着部材と配向膜とは、一部分が重なるようにして設けられ、前記接着部材が配置される領域の幅Ｄと、接着部材と配向膜とが重なり合う第３領域の幅ｄとは、Ｄ＞ｄ＞０の範囲に選ばれる。配向膜表面と接着部材とによって液晶が注入されるべき空間と当該空間に連通する注入孔とが形成され、前記幅Ｄと幅ｄとが、Ｄ＞ｄ＞０の範囲に選ばれるので、接着部材は配向膜以外の比較的密着性の高い表面と少なくとも一部分で接触する。したがって、接着部材と基板部材との密着性が向上する。また、大気中の水分の吸湿による液晶材料の電気抵抗値の低下が防止できる。さらに、注入孔を形成する表面にも配向膜が形成されるので、液晶注入時において液晶に当該液晶の電気抵抗値を低下させる不純物が混入せず、また液晶の配向不良も生じない。したがって、表示品位が優れ、信頼性が高く、さらに小形の液晶表示装置を提供することができる。

【００２２】また本発明は、前記第１領域の形状は矩形に選ばれ、第２領域の形状は第１領域よりも小さい矩形に選ばれ、矩形の第２領域の一辺は、矩形の第１領域の一辺と当接することを特徴とする。

本発明に従えば、配向膜は、少なくとも上述した矩形の第１領域および第２領域に形成される。このような領域に配向膜を形成した場合であっても、上述した作用によって、接着部材と基板部材との密着性が向上し、液晶材料の電気抵抗値の低下が防止できて、液晶の配向不良が生じなくなる。このため、表示品位が優れ、信頼性が高く、小形の液晶表示装置を提供することができる。

【００２３】また本発明は、表示電極が形成された絶縁性基板上の、少なくとも前記第２領域から基板部材の外方に向けて突出する第４領域が、前記封止部材によって覆われていることを特徴とする。

本発明に従えば、第４領域が封止部材によって覆われるので、当該第４領域に配向膜が形成されていても、当該配向膜は封止部材によって覆われることとなり、配向膜の吸湿による液晶材料の電気抵抗値の低下をさらに防止することができる。

【００２４】また本発明は、前記配向膜は、界面活性剤層上に形成されていることを特徴とする。

本発明に従えば、前記配向膜は界面活性剤層の上に形成されている。前記界面活性剤層は、配向膜および接着部材と、これらの部材が形成される基板との密着性を改善し、向上させる。このような界面活性剤は液晶中に混入すると液晶材料の電気抵抗値を低下させてしまうけれども、本発明では、注入孔を形成する表面にも配向膜が形成されるので、液晶中に界面活性剤が混入することはなく、電気抵抗値の低下が防止できる。

【００２５】

【発明の実施の形態】図１は、本発明の実施の一形態である液晶表示装置１の作成方法を段階的に示す平面図であり、図２はその断面図である。液晶表示装置１は、一対の基板部材６，１２、液晶層１４、接着部材７および封止部材１３を含んで構成される。一対の基板部材６，１２は、透光性基板２，８、透明電極３，９、界面活性剤層４，１０および配向膜５，１１をそれぞれ有する。たとえば、液晶表示装置１がアクティブマトリクス駆動型のカラー表示を行う液晶表示装置である場合には、一対の基板部材６，１２のいずれか一方の基板部材はアモルファスシリコンＴＦＴ（薄膜トランジスタ）素子、ポリシリコンＴＦＴ素子または、ＭＩＭ（金属－絶縁膜－金属）素子などのスイッチング素子を有し、他方の基板部材はカラーフィルタを有する。また、スイッチング素子を有する側の基板部材の透明電極は画素毎に設けられる画素電極となり、カラーフィルタを有する側の透明電極は共通電極となる。

【００２６】図１（１）および図２（１）に示される少

なくとも絶縁性を有し、たとえばガラスで実現される透光性基板２の一方表面２ａ上には、図１（２）および図２（２）に示されるように表示用の透明電極３が形成され、さらにシランカップリング剤などの界面活性剤が塗布されて界面活性剤層４が形成される。界面活性剤層４は、後述する配向膜５および接着部材７と透光性基板２との密着性を改善するために設けられる。たとえば、ＴＦＴ素子を設けた場合、透光性基板２の表面にはＳｉＮ，ＳｉＯ，ＩＴＯなどの無機物が露出する。これらはポリイミドなどの配向膜材料との密着性が低い。前記界面活性剤層４としてのシランカップリング剤分子の一方端部にはビニル基やアルコキシ基などのポリイミドと結合しやすい官能基が存在し、他方端部には、アルコキシ基やハロゲンなどの無機物と相性のよい官能基が存在する。このため、密着性が向上する。

【００２７】次に、図１（３）および図２（３）に示されるように配向膜５が形成される。配向膜５は、たとえばポリイミド樹脂で実現され、当該ポリイミド樹脂は後述するような凸版印刷法によって塗布される。配向膜５は、少なくとも液晶が注入されるべき空間を形成する第１領域１５ａ、すなわち液晶注入領域１５と、前記空間に連通する注入孔を形成する第２領域１６、すなわち注入孔領域１６とに形成される。また、たとえば後述する接着部材７が形成される領域の一部分である第３領域１５ｂにも形成される。凸版印刷法によって塗布されたポリイミドなどの樹脂膜表面にラビング処理などの配向処理が施されて、配向膜５とされる。

【００２８】また好ましくは、前記第１領域１５ａの形状は矩形に選ばれ、第２領域１６の形状は第１領域１５ａよりも小さい矩形に選ばれる。矩形の第２領域１６の一辺１６ａは、矩形の第１領域１５ａの一辺１５ｃと当接する。このようにして一方基板部材６が形成される。

【００２９】一方基板部材６の界面活性剤層４および配向膜５上には、図１（４）および図２（４）に示されるように、たとえば５μｍのガラスファイバが混入されたエポキシ系紫外線硬化型樹脂などで実現される接着部材７がスクリーン印刷法によって塗布される。接着部材７は、概ね配向膜５を囲むように形成され、また配向膜５および接着部材７の印刷の位置合わせの精度を考慮して、たとえば図示されるように配向膜５の一部分と重畳して形成される。位置精度を考慮する必要がないときには、重畳しないように形成しても構わない。なお、接着部材７によって囲まれる基板内方の領域は、液晶が注入されるべき空間を形成する第１領域１５ａ、すなわち液晶注入領域１５、および前記液晶が注入されるべき空間に連通し、液晶を前記空間に注入する注入孔を形成する第２領域１６、すなわち注入孔領域１６である。

【００３０】さらに、前記一方基板部材６と同様にして作成され、透光性基板８、透明電極９、界面活性剤層１０および配向膜１１を有する他方基板部材１２が、図１（５）に示されるように、前記接着部材７が塗布された一方基板部材６と貼合わせられる。このとき、一方基板部材６の配向膜５と、他方基板部材１２の配向膜１１とが互いに対向するようにして貼合わせられる。また、他方基板部材１２の端部表面には、導電性カーボンがディスペンサなどを用いて塗布される。このようにして一対の基板部材６，１２を貼合わせ、当該基板部材６，１２の間隔が均一になるように圧力をかけ、接着部材７を硬化させる。これによって、前記液晶が注入されるべき空間１８と、注入孔１７とが形成される。

【００３１】液晶が注入されるべき空間１８には、前記注入孔１７から液晶が注入され、これによって液晶層１４が形成される。液晶の注入が完了すると、前記注入孔１７の入口は、たとえばエポキシ系紫外線硬化型樹脂などで実現される封止部材１３によって封止される。すなわち、第２領域１６の前記辺１６ａに対向する辺１６ｂから基板部材６，１２の外方に向けて突出する第４領域１９が、少なくとも封止部材１３によって覆われる。このようにして図１（６）および図２（５）に示される液晶表示装置１が完成する。

【００３２】なお、本形態では、一方基板部材６は、他方基板部材１２よりも大きい。したがって、第４領域１９は、一方基板部材６にのみ形成され、少なくともこの第４領域１９が封止部材１３によって覆われる。

【００３３】図３は、凸版印刷法によってポリイミド樹脂を塗布する際に用いられる凸版版下２１を示す平面図であり、図４は凸版印刷法を説明するための断面図である。凸版版下２１は、たとえば金属板で実現され、その一方表面には、たとえばフォトリソグラフィ法によって配向膜５，１１の形状と等しい配向膜パターン２２が凸部として形成されている。配向膜パターン２２は、用いた矩形状の金属板のたとえば長手方向に平行で、かつ金属板表面を２等分する中心線３５に対して対称に形成される。凸版印刷時には、中心線３５に平行な方向２３に凸版版下２１が搬送され、たとえば搬送方向下流側に前記注入孔を形成するための配向膜のパターンが配置される。

【００３４】このような凸版版下２１は、ローラ状の版胴３０の表面に取付けられる。凸版印刷時には、ディスペンサ２６から配向膜材料２７が予め定める速度で供給され、当該配向膜材料２７はドクタロール２８およびアニロクスロール２９によって、供給量がさらに調整される。ドクタロール２８の表面とアニロクスロール２９の表面とは互いに接触するようにして設けられ、互いに反対方向３１，３２にそれぞれ回転する。ドクタロール２８の表面と、版胴３０に取付けられた凸版版下２１の凸部である配向膜パターン２２の表面とは、互いに接触するようにして設けられ、ドクタロール２８と版胴３０とは互いに反対方向３１，３３にそれぞれ回転する。供給量が調整されてドクタロール２８に付着した配向膜材料

２７は、配向膜パターン２２の表面に転写される。

【００３５】また、版胴３０に取付けられた凸版版下２１の配向膜パターン２２の表面と、ステージ２４上に載置され、配向膜を形成すべき基板２５の表面とは、互いに接触するようにして配置され、版胴３０が前記回転方向３３に回転し、ステージ２４が版胴３０の回転方向３３に沿った方向３４に移動して前記基板２５が当該方向３４に搬送されることによって、凸版版下２１の配向膜パターン２２表面に付着した配向膜材料２７が基板２５の表面に転写される。このようにして配向膜材料２７が塗布された後、配向処理が施されて配向膜５，１１が作成される。

【００３６】本形態では、図３に示されるような凸版版下２１を用いて配向膜５，１１となる配向膜パターンを形成している。版胴３０に取付けられる凸版版下２１の位置と、ステージ２４上に載置される基板２５の位置とは予め決められているので、このような中心線３５に対して対称に配置された配向膜パターン２２を有する凸版版下２１を用いて、配向膜５，１１をともに形成すると、形成される注入孔１７は、注入孔１７を設けた側の辺の中央に配置されることとなる。したがって、同一の凸版版下２１を用いて互いに異なる基板側の配向膜５，１１を形成することができ、注入孔１７を中央からずれた位置に設ける場合に要する凸版版下の取替え作業が不要となり、生産効率が向上する。

【００３７】図５は、注入孔１７を拡大して示す平面図であり、図６は切断面線Ｉ－Ｉの断面図である。本発明では接着部材７と、配向膜５，１１とを一部分で重なるように設けてもよく、また重ならないように設けてもよく、したがって接着部材７の幅をＤとし、接着部材７と配向膜５または配向膜１１との重なり合う第３領域１５ｂの幅をｄとすると、Ｄ＞ｄ≧０の範囲に選ばれる。本来は、幅ｄ＝０が好ましいけれども、前述したような凸版印刷法で配向膜５，１１となるポリイミド樹脂を塗布し、接着部材７をスクリーン印刷法で塗布する場合、両者の位置合わせ精度上、いくらかの余裕を持たせておくことが好ましい。したがって、上述したようなＤ＞ｄ≧０の範囲が選ばれる。たとえば、幅Ｄ＝１．２mmに選ばれ、幅ｄ＝０．３mmに選ばれる。この場合、位置合わせ精度が、たとえば±０．０５mmであったときには、幅ｄは０．２mm～０．４mmの範囲となる。

【００３８】なお、前述したように第４領域１９は封止部材１３で覆われる。したがって、上述したような位置合わせ精度を考慮して、図５に示されるように、たとえば一方の配向膜５の注入孔領域１６から基板部材６の外方に向けて突出する第４領域１９にも配向膜５が形成されたとしても、当該配向膜部分５ａは、注入孔１７を封止する封止部材１３によって覆われる。したがって、配向膜５が大気に接触することはなく、吸湿による液晶の電気抵抗値の低下が防止できる。

【００３９】図７は、実際に設定される表示領域３７，４３を示す平面図である。図７（１）は本形態の液晶表示装置１を示し、図７（２）は従来の液晶表示装置３８を示す。従来の液晶表示装置３８は、凸版印刷法によって配向膜を形成したものであるけれども、注入孔を形成する領域１６には配向膜が設けられていない。表示領域は、液晶が注入されるべき空間内に接着部材の液晶層側端部から液晶層内方に向かって予め定める長さの余裕を持たせて設定される。本形態の場合は、注入孔１７が設けられた側の接着部材７の液晶層側端部から表示領域３７までの長さＬ１は、注入孔１７が設けられていない側の接着部材７の液晶層側端部から表示領域３７までの長さＬ２～Ｌ４と同じ長さにすることが可能となる。たとえば、長さＬ１～Ｌ４はともに０．０５mm以上に選ばれる。

【００４０】一方、従来の液晶表示装置３８の場合は、液晶注入時において注入孔４４部分で液晶に混入した界面活性剤などの不純物の影響を防止するために、前記長さＬ１は、長さＬ２～Ｌ４よりも大きく選ばれる。このため、液晶表示装置３８が比較的大きくなる。

【００４１】本形態の場合、接着部材７の液晶層側端部同士間の長さであって、注入孔１７が設けられた側の辺に垂直な方向の長さＡ１は、たとえば１５．８mmに、同様の方向の表示領域３７の長さＡ２は、たとえば１４．２mmに、接着部材７の液晶層側端部同士間の長さであって注入孔１７が設けられた側の辺に平行な方向の長さＢ１は、たとえば１２．０mmに、同様の方向の表示領域３７の長さＢ２は、たとえば１０．４mmにそれぞれ選ばれる。従来の液晶表示装置３８の場合、たとえば前記長さＡ１は１６．３mmに、前記長さＡ２は１４．２mmに、前記長さＢ１は１２．０mmに、前記長さＢ２は１０．４mmにそれぞれ選ばれる。このように、表示領域３７，４３の大きさを同一としたままで長さＡ１を０．５mmだけ縮小することができる。この縮小できた長さは、Ａ１＝１５．８mmに対して約３％にあたり、たとえばビューファインダやプロジェクション装置用の液晶表示装置など、比較的小形の液晶表示装置において、さらに小形化を実現しようとする場合における効果は大きい。

【００４２】続いて、本形態の液晶表示装置と、従来技術の液晶表示装置との電圧保持率および配向不良の程度を評価した結果について説明する。図８および図９は、この評価に用いた評価用液晶表示装置の電極形状を示す平面図である。なお、図中において液晶表示装置１と同じ構成部材には同様の参照符を付して示す。評価用液晶表示装置の一方基板部材６側の前記透明電極３に代わって設けられる透明電極３ａ～３ｃは、液晶の注入方向Ｓに沿って、３カ所にそれぞれ設けられる。透明電極３ａ～３ｃは、注入孔１７側の基板端部とは直交する２つの基板端部のうちのいずれか一方基板端部側に引き出され

ている。また他方基板部材１２側の透明電極９ａは、透光性基板８のほぼ全面に形成される。

【００４３】表１には、電圧保持率の評価結果を示す。また表２には、配向不良領域の長さを示す。本形態のように液晶注入領域１５と注入孔領域１６とに配向膜を形成した液晶表示装置についての結果を（ａ）として示し、図１２および図１３に示すように、液晶注入領域１５と注入孔領域１６の一部分とに配向膜を形成した液晶表示装置についての結果を（ｂ）として示し、図１０および図１１に示すように、透明電極が形成された透光性基板のほぼ全面に配向膜を形成した液晶表示装置についての結果を（ｃ）として示す。また、上述したような異なる位置に形成された透明電極３ａ～３ｃ部分の電圧保持率の結果を順番に①、②、③としてそれぞれ示す。なお、２５℃の環境に保持された装置に対して、６０Ｈｚ、±５Ｖの矩形波の電圧を印加し、作成直後の電圧保持率と、６０℃、９５％ＲＨの環境下で５００時間駆動したエージング後の電圧保持率とを測定した。さらに、配向不良領域の長さを、図９に示す接着部材７ａ～７ｄの液晶層側端部からの長さとして、ｗ，ｘ，ｙ，ｚでそれぞれ示す。接着部材７ａ～７ｄとは、注入孔１７とは反対側、前記透明電極３ａ～３ｃが引き出された側、透明電極３ａ～３ｃが引き出された側に対向する側、および注入孔１７側の接着部材７の部分を指す。

【００４４】

【表１】

作成条件	測定位置	電圧保持率（％）エージング時間	
		初　期	５００時間
（ａ）	①	９９．３	９９．０
	②	９９．４	９９．１
	③	９９．３	９９．０
（ｂ）	①	９９．４	９８．７
	②	９９．２	９８．１
	③	９８．５	９７．５
（ｃ）	①	９９．４	９８．５
	②	９９．３	９９．０
	③	９９．２	９８．３

【００４５】

【表２】

作成条件	測定位置	配向不良領域（ｍｍ）エージング時間	
		初　期	５００時間
（ａ）	ｗ	０．０	０．０４
	ｘ	０．０	０．０５
	ｙ	０．０	０．０５
	ｚ	０．０	０．０６
（ｂ）	ｗ	０．０	０．０５
	ｘ	０．０	０．０６
	ｙ	０．０	０．０６
	ｚ	０．０５	０．２５
（ｃ）	ｗ	０．０	０．０９
	ｘ	０．０	０．１１
	ｙ	０．０	０．１０
	ｚ	０．０	０．１２

【００４６】作成直後においては、液晶注入領域１５と注入孔領域１６の一部分とに配向膜を形成した液晶表示装置（ｂ）の注入孔１７に最近接する透明電極３ｃ部分（③）が、他の部分が全て電圧保持率が９９％以上であるのに対して、９８．５％と低いことがわかる。エージング後においては、液晶注入領域１５と注入孔領域１６とに配向膜を形成した液晶表示装置（ａ）に関しては、透明電極３ａ～３ｃのいずれの部分（①～③）についても、９９％以上を保持しているのに対し、他の液晶表示装置（ｂ），（ｃ）に関しては、透明電極３ａ～３ｃのうちのいずれかの部分で電圧保持率の低下が見られる。

【００４７】また、作成直後においては、液晶表示装置（ｂ）で、注入孔１７側の接着部材７ｄの部分（ｚ）のみに配向不良が生じており、当該装置（ｂ）の接着部材７ｄ以外の部分（ｗ，ｘ，ｙ）および他の液晶表示装置（ａ），（ｃ）のいずれの部分にも配向不良は生じていない。エージング後においては、いずれの液晶表示装置（ａ）～（ｃ）に関しても、またいずれの部分（ｗ，ｘ，ｙ，ｚ）に関しても、配向不良が生じていることが分かる。しかしながら、配向不良の生じている領域の長さは、液晶表示装置（ａ）が最も小さいことがわかる。

【００４８】このように、本形態の液晶表示装置は、電圧保持率の低下が少なく、また表示不良の程度も比較的小さく、優れた表示品位が得られるものである。

【００４９】以上のように本形態によれば、接着部材７は、配向膜５，１１と比較して密着性の高い界面活性剤層４，１０と少なくとも一部分が重なるようにして設けられるので、スピンコート法で配向膜を全面に設けた場合と比較すると密着性が向上し、接着部材７と配向膜５，１１との間での剥離がなくなる。また、配向膜５，１１は大気に接触しないので、大気中の水分の吸湿による液晶の電気抵抗値が低下することを防止できる。さら

に、注入孔１７を形成する注入孔領域１６にも配向膜５，１１が形成されるので、液晶注入時において液晶に界面活性剤などの不純物が混入して、液晶の電気抵抗値が低下することがなくなる。

【００５０】したがって、不純物の混入による表示品位の低下を考慮しなくてもよくなり、液晶表示装置の小形化を図ることが可能となる。これは、ビューファインダやプロジェクション装置用などの比較的小形の液晶表示装置において、その効果が顕著となる。また、液晶表示装置の大きさを同じとすると、表示領域の拡大を図ることが可能となる。

【００５１】なお、本形態では、同一の凸版版下２１を用いて配向膜５，１１を形成して生産効率を向上するために、注入孔１７を注入孔側の辺の中央に配置しているけれども、比較的大形の液晶表示装置においては、液晶注入時における注入孔付近に付着する液晶を最小限とするために、注入孔を液晶表示装置の角部に配置することも可能である。注入孔を角部に配置することによって、注入されるべき液晶を満たした液晶浴中に浸漬する領域を少なくすることができて、付着量が少なくなる。このため、付着した液晶を除去する作業が短時間で行える。小形の液晶表示装置の場合には、小形であるゆえに付着量が根本的に少なく、付着した液晶の除去作業を短時間で行えることから、本形態のように注入孔１７を中央に配置することが可能である。

【００５２】また本発明は、小形の液晶表示装置に限らず、大形の液晶表示装置、特に液晶表示装置の表示面に平行な装置の総面積に対する表示領域の割合を大きくしたもの、すなわち表示領域の周辺部分を狭くした液晶表示装置において実施した場合であっても、同様の効果が得られ、表示品位が向上する。

【００５３】

【発明の効果】以上のように本発明によれば、接着部材は、配向膜以外の比較的密着性の高い表面と接触するようにして設けられるので、接着部材の密着性が向上する。また、配向膜は大気に接触しないので吸湿による液晶の電気抵抗値の低下が防止できる。さらに、注入孔を形成する表面にも配向膜が形成されるので、液晶注入時において液晶の電気抵抗値を低下させる界面活性剤などの不純物が液晶に混入することが防止できる。

【００５４】したがって、不純物の混入による表示品位の低下を考慮する必要がなくなり、前記表示品位の低下を考慮して設けていた接着部材と表示領域との間隔を小さくすることができ、液晶表示装置の小形化を図ることが可能となる。

【００５５】また本発明によれば、接着部材は、配向膜以外の比較的密着性の高い表面と少なくとも一部分が接触するようにして設けられる。したがって、上述したのと同様に、接着部材の密着性が向上し、液晶の電気抵抗値の低下が防止でき、液晶表示装置の小形化を図ることができる。

【００５６】また本発明によれば、Ｄ＞ｄ＞０の範囲となるように接着部材と配向膜との重なる領域の幅ｄが選ばれる。したがって、接着部材は比較的密着性の高い表面と少なくとも一部分が接触し、密着性が向上する。

【００５７】また本発明によれば、第１および第２領域は矩形に選ばれる。このような領域に配向膜を形成したときであっても、接着部材の密着性は向上する。

【００５８】また本発明によれば、注入孔を形成する第２領域から基板部材の外方に向けて突出する第４領域に、たとえば配向膜が形成されたとしても、当該配向膜は封止部材によって覆われるので、吸湿による液晶の電気抵抗値の低下が防止できる。

【００５９】さらに本発明によれば、前記配向膜は界面活性剤層上に形成される。この界面活性剤層によって配向膜および接着部材とこれらの部材が形成される基板との密着性が向上する。このような界面活性剤層を設けても注入孔を形成する表面には配向膜が形成されるので、液晶注入時において液晶に界面活性剤が混入することはない。

【図面の簡単な説明】

【図１】本発明の実施の一形態である液晶表示装置１の作成方法を段階的に示す平面図である。

【図２】前記液晶表示装置１の作成方法を段階的に示す断面図である。

【図３】凸版印刷時において用いられる凸版版下２１を示す平面図である。

【図４】凸版印刷法を説明するための断面図である。

【図５】注入孔１７を拡大して示す平面図である。

【図６】前記注入孔１７を切断面線Ｉ－Ｉで切断したときの断面図である。

【図７】表示領域３７，４３を示す平面図である。

【図８】電圧保持率および配向不良の程度を評価するために用いた液晶表示装置の電極形状を示す平面図である。

【図９】電圧保持率および配向不良の程度を評価するために用いた液晶表示装置の電極形状を示す平面図である。

【図１０】従来の液晶表示装置５１の作成方法を段階的に示す平面図である。

【図１１】前記液晶表示装置５１の作成方法を段階的に示す断面図である。

【図１２】従来の他の液晶表示装置６９の作成方法を段階的に示す平面図である。

【図１３】前記液晶表示装置６９の作成方法を段階的に示す断面図である。

【符号の説明】

１　液晶表示装置

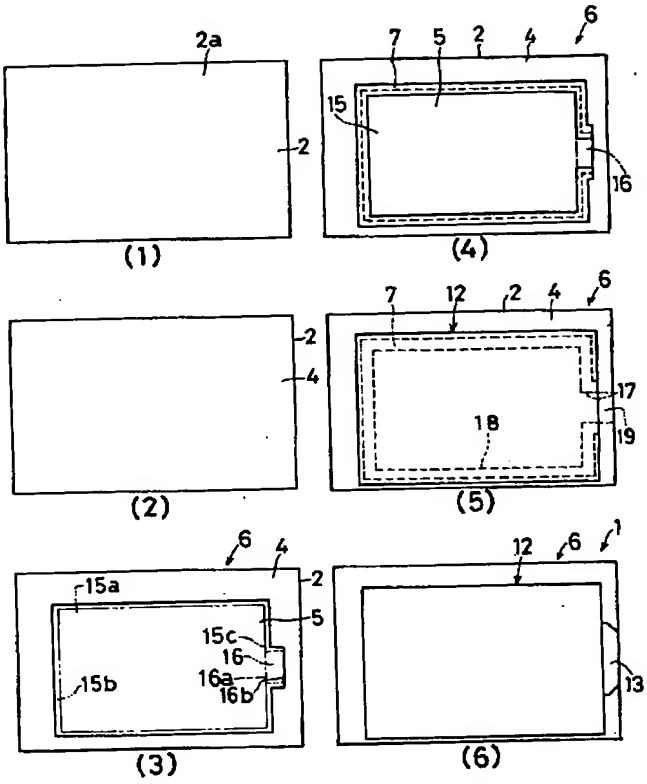
２，８　透光性基板

３，９　透明電極

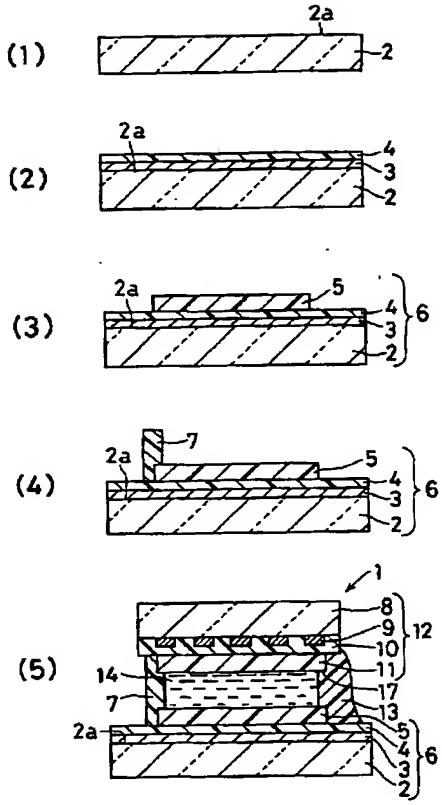
4，１０　界面活性剤層
5，１１　配向膜
6　一方基板部材
7　接着部材
１２　他方基板部材

１３　封止部材
１４　液晶層
１５　液晶注入領域
１６　注入孔領域
１７　注入孔

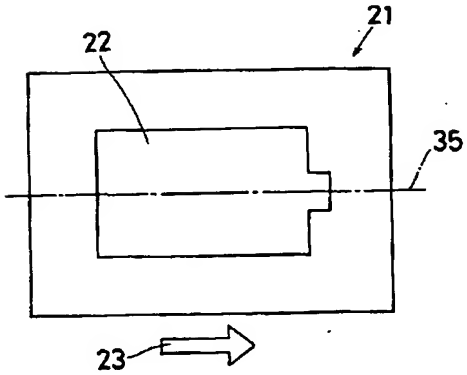
【図１】



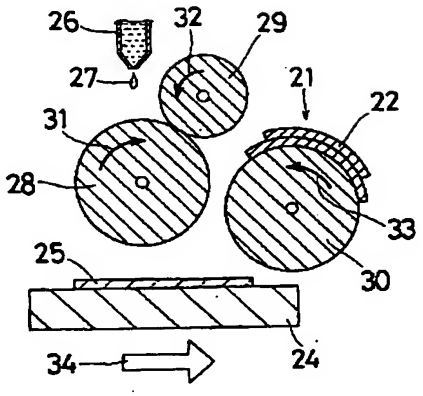
【図２】



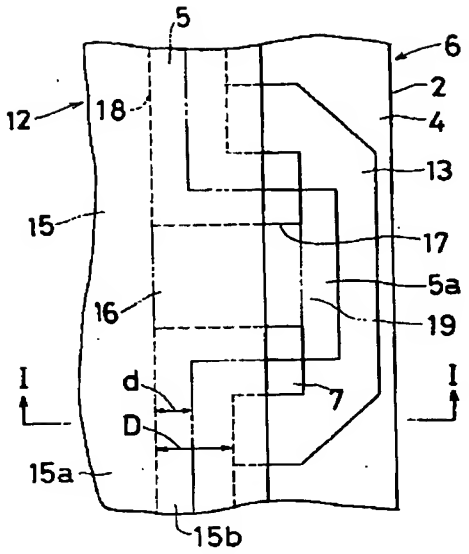
【図３】



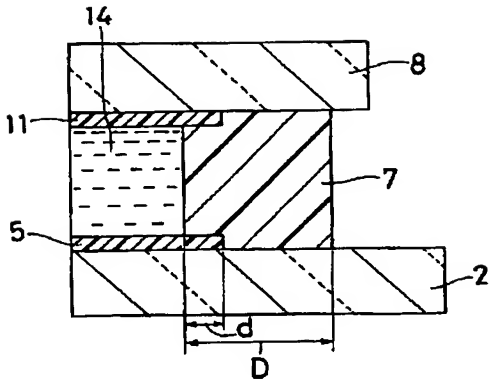
【図４】



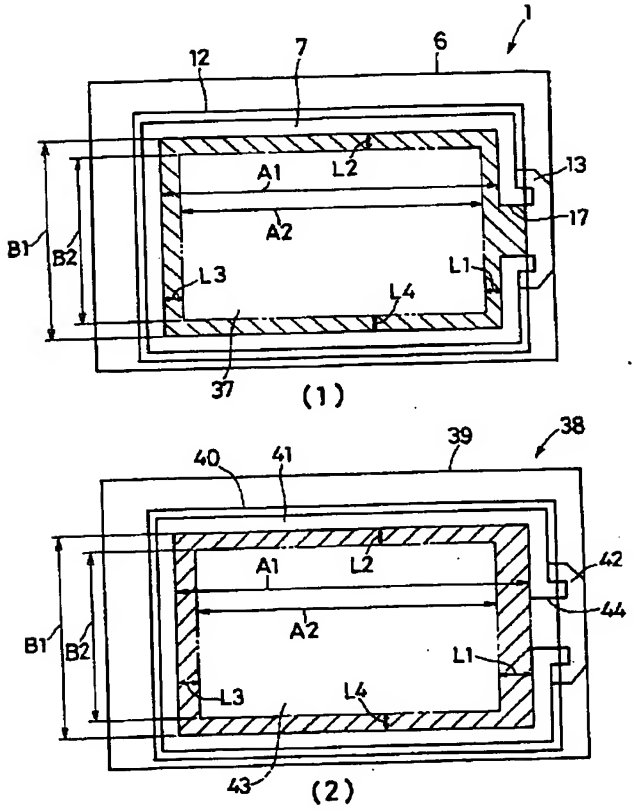
【図5】


5
6
2
4
12
18
13
15
17
5a
16
19
I
d
7
I
D
15a
15b

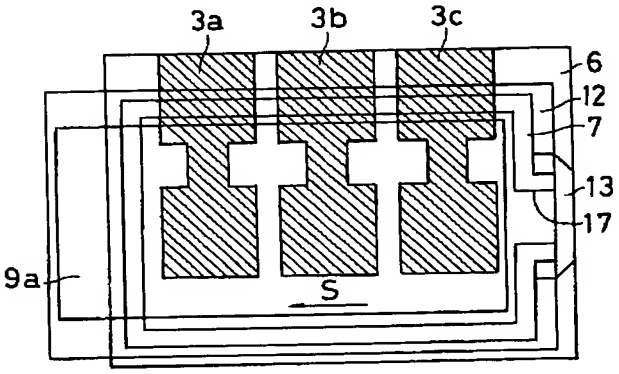
【図6】


14
8
11
7
5
2
d
D

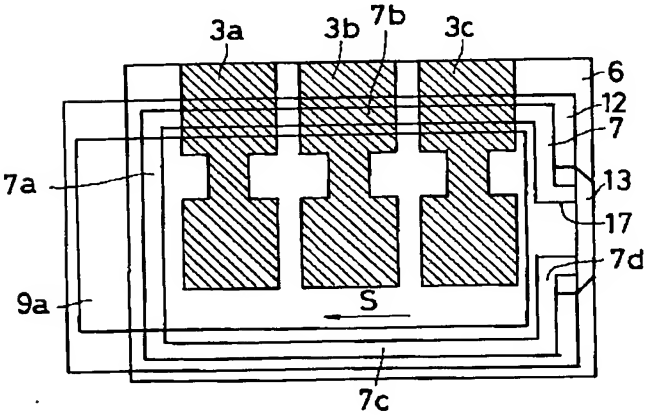
【図7】


1
12
7
6
A1
L2
13
17
A2
B1
B2
L3
L1
L4
37
(1)
39
38
40
41
42
44
A1
L2
A2
B1
B2
L1
L3
L4
43
(2)

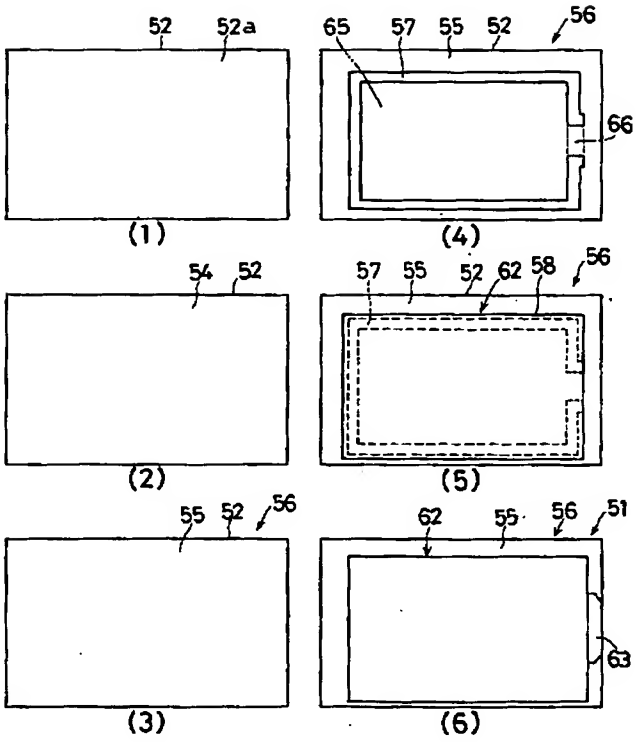
【図8】


3a
3b
3c
6
12
7
13
17
9a
S

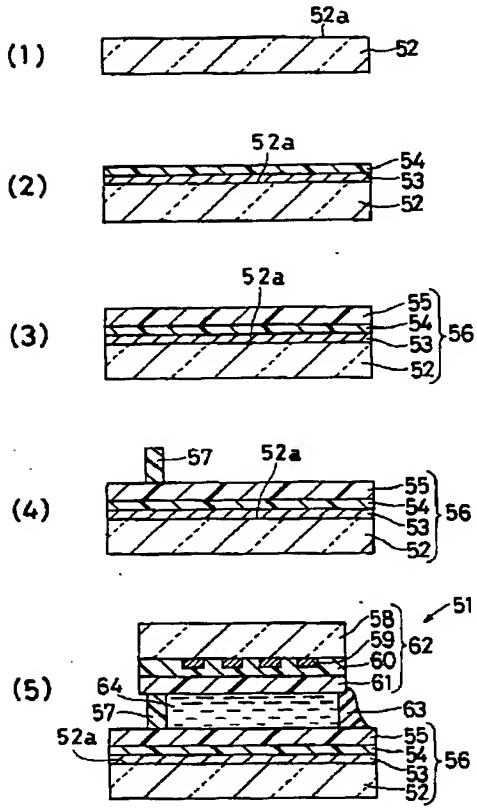
【図9】


3a
3b
7b
3c
6
12
7
7a
13
17
7d
9a
S
7c

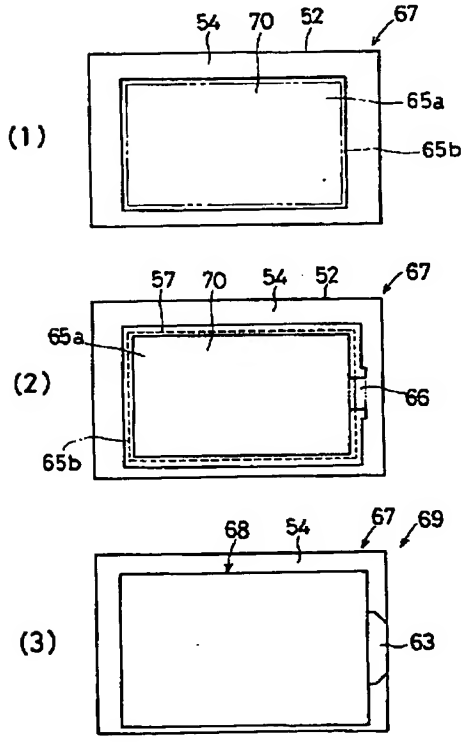
【図１０】



【図１１】



【図１２】



【図１３】